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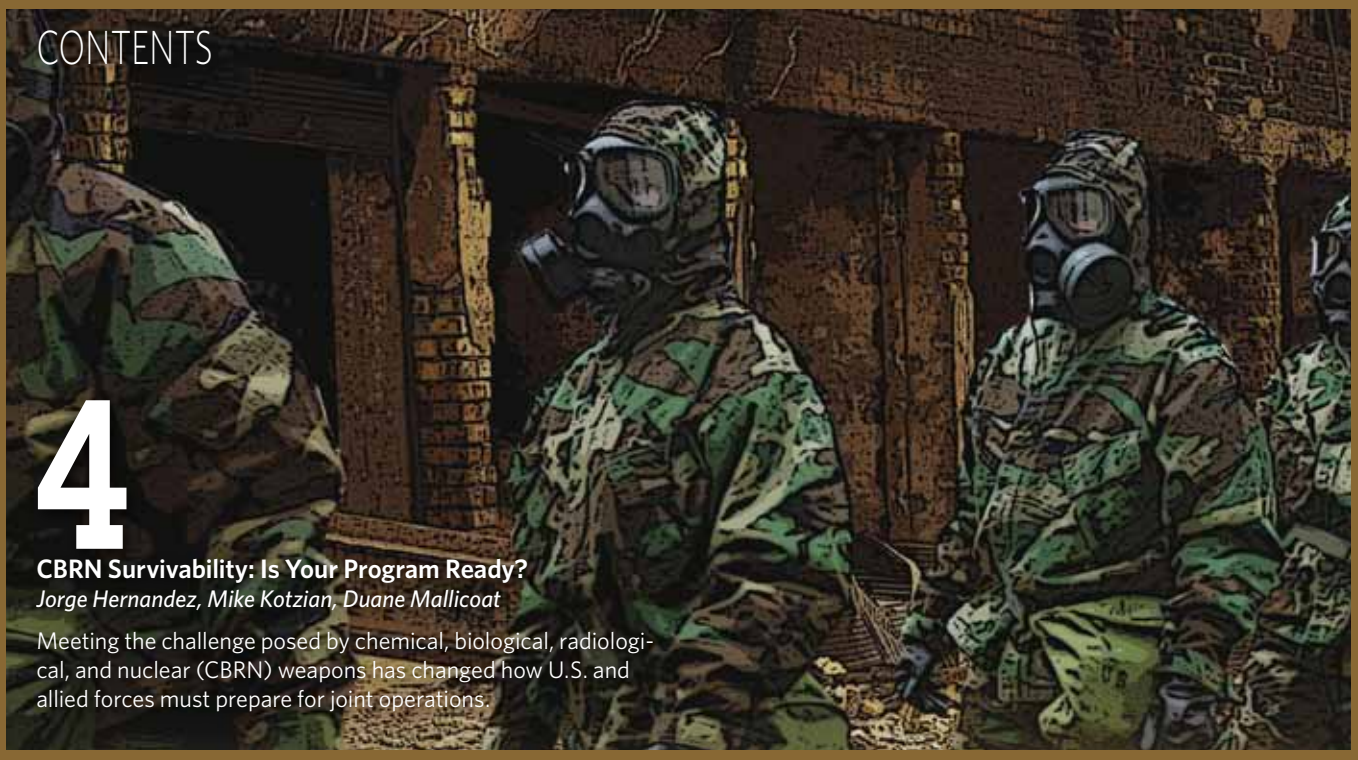
CBRN Survivability: Is Your Program Ready?

The Challenges We Face— *by the Under Secretary of Defense (AT&L)*

Should-Cost Management Tactics

Marching an Army Acquisition Program Toward Success

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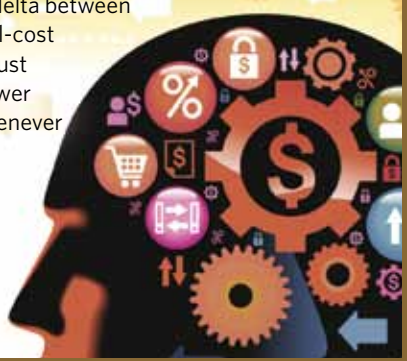


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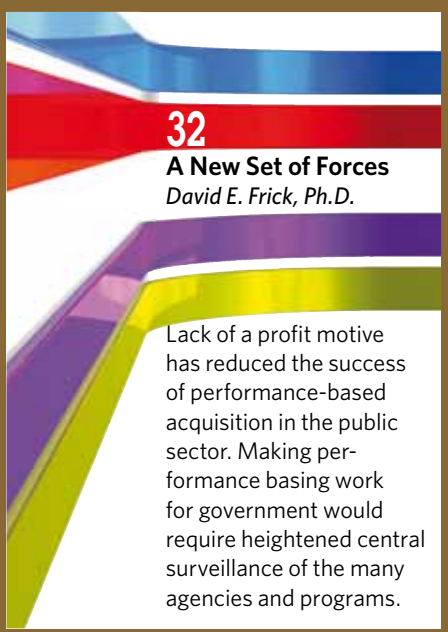
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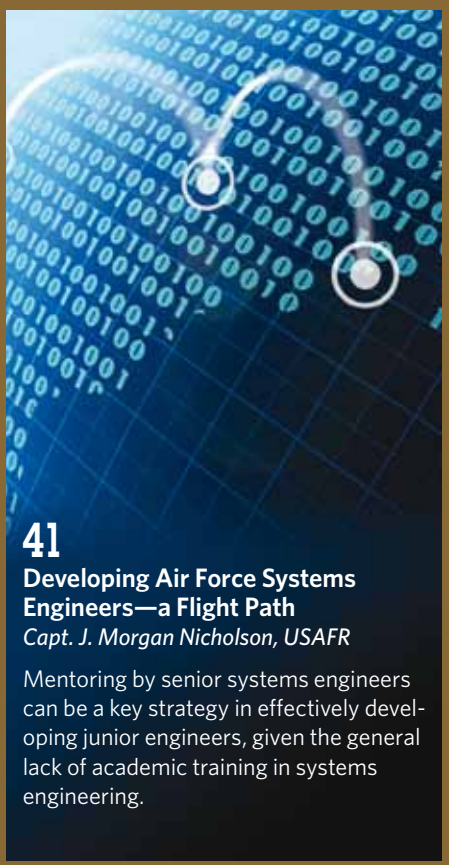
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The Challenges We Face—And How We Will Meet Them

Frank Kendall
Under Secretary of Defense for Acquisition, Technology and Logistics



"Supporting the warfighter, protecting the taxpayer"—these words were suggested by my military assistant for a small sign outside the door to my office in the Pentagon. They succinctly express the challenges those of us who work in defense acquisition, technology, and logistics face in the austere times we have entered. We will have to provide the services and products our warfighters need and protect the taxpayers' interest by obtaining as much value as we possibly can for every dollar entrusted to us. This is nothing new; we have always tried to do this. Going forward, however, we will have to accomplish this goal without reliance on large overseas contingency funding and in the face of continued pressure on defense budgets brought about not by a change in the national security environment, which is increasingly challenging particularly with the emergence of more technologically and operationally sophisticated potential opponents, but by the policy imperative to reduce the annual budget deficit. Hopefully, the specter of more than $50 billion in sequestration cuts next year will be avoided, but, even if it is, we can expect the pressure on defense budgets to increase. Last winter, the department published new strategic guidance as well as a budget designed to implement that strategy. Like all budgets, this one did not make any allowance for overruns, schedule slips, or increases in costs for services beyond the standard indices assumed by the Office of Management and Budget, indices that often are exceeded. We have our work cut out for us today and for as far into the future as we can see.

The overriding imperative of obtaining the greatest value possible for the dollars entrusted to us is not just an acquisition problem; it encompasses all facets of defense planning, as well as execution of acquisition programs and contracted services. We have to begin by understanding and controlling everything that drives cost or leads to waste. The budgeting/programming and requirements communities are as important to success as our planning and management and industry's execution of acquisition contracts. The quest for value includes an understanding of: (1) the constraints we must live within; (2) a willingness to prioritize our needs and accept less than we

might prefer; (3) an understanding of the relative value of the capabilities we could acquire; and (4) an activist approach to controlling costs while we deliver the needed capability. Only the last of these is solely an acquisition responsibility.

For the last 2 years, and as part of the original Better Buying Power initiative, we required that affordability caps be placed on programs entering the acquisition process. These caps are not the result of anticipated costs; they are the result of an analysis of anticipated budgets. Here is a simple example of what I mean: If we have to maintain a fleet of 100,000 trucks that we expect to last 20 years, then we will have to buy an average of 5,000 trucks per year. If we can only expect to have $1 billion a year to spend on trucks, we must buy trucks that cost no more than $200,000 each. That $200,000 is our affordability cap. Affordability is not derived from cost; it dictates cost constraints that we have to live within. The source of the type of analysis illustrated here is generally not the acquisition community; it comes primarily from force planners and programmers, working in collaboration with acquisition people. We have affordability caps on a number of programs now, both for production costs and sustainment costs. Our greatest challenge going forward will be to enforce those caps.

To achieve affordability caps, we will need a willingness to identify and trade off less important sources of cost. In other words, we will have to prioritize requirements, identify the costs associated with meeting those requirements, and drop or defer the capabilities that do not make the affordability cut. This is a simple formula, but one the department has been reluctant to act on in the past. Too often, our history has been one of starting programs with desirable but ambitious requirements, spending years and billions of dollars in development, and perhaps in low rate production, and then finally realizing that our reach had exceeded our grasp. The most recent example of this is the Expeditionary Fighting Vehicle, which was canceled after many years in development because it was unaffordable. There are many others. The acquisition community and the requirements communities must work together to understand priorities and make these choices as early as possible. Delay in confronting difficult trade-offs will only lead to waste. If a 1 percent or 2 percent change in a performance goal will result in a 10 percent or 20 percent cost reduction, that trade should be considered as early as possible. Configuration Steering Boards are one mechanism to address requirements trade-offs, but they must meet often, be empowered, and have the data they need to make informed decisions. When the affordability of the full requirements for a new product that hasn't been developed yet is uncertain, industry must be given prioritized requirements so that its offerings can be optimized to meet the highest-priority user needs within the cost cap. Again, this takes close cooperation between communities and the willingness on the part of the requirements community to articulate priorities and to take into consideration the costs of meeting less essential requirements.

One situation I have seen on occasion in the last few years, and one I expect we will see more in the future, is the case in which "best value" has to be clearly defined. Often in these cases there is a competition between companies offering dissimilar capability levels based on existing products that may be modified to meet a need. The Air Force tanker program is an example of this: Both offerings were based on commercial aircraft and both could meet the basic requirements, but they also had differing capabilities with disparate military utility as well. In situations like this, the onus is on us, primarily on the user, to determine the value to the government of the different levels of capability and to apply that understanding objectively in the source selection process. Defining the value of a capability to the customer (what the customer is willing to pay for something) has nothing to do with the cost of the capability. Read that last sentence again—it is very important. In the KC-46 tanker situation, the Air Force determined that it was only willing to pay up to 1 percent more for the extra features that might be offered. Again, this had nothing to do with what those features cost. The bottom line is that, in the austere times we can expect going forward, we will need to understand how much we are willing to pay in total (the affordability cap) and how much of a premium we are willing to pay for additional capability beyond the threshold requirement. We will also have to communicate these parameters clearly to industry.

If we have constrained our appetites to what we can afford and to what we consider best value, now we have to execute more effectively than we have in the past. Historically, we have overrun development programs in the high 20 percent range, and we have overrun early production lots by almost 10 percent. This has to stop. It will not stop because of any one thing we do or any one set of policies. If controlling acquisition costs were easy, we would have done it decades ago.

Soon I will be publishing the next round of Better Buying Power initiatives (BBP 2.0), perhaps by the time this article goes to press. However, the central idea of Better Buying Power is not the list of specific management practices or policies we are currently emphasizing. The central idea is that we must all continuously look for ways to improve how we do business and the outcomes we achieve. We have to understand our costs; we have to look for opportunities to reduce them; and we have to attack unnecessary costs as the enemy of the department that they are. The whole idea of "should cost" management approaches and goals reflects this concept. So too do the various policy, management, and contracting initiatives we are pursuing under the Better Buying Power rubric and throughout everything we do.

We should not be content with staying within our budgets. It is not our job to spend the budget. It is our job to provide our warfighters with the greatest value we can for every penny of the money the taxpayers provide to us. If we keep this always firmly in mind, we will successfully meet the challenges we face. &





CBRN Survivability

Is Your Program Ready?

Jorge Hernandez ■ *Mike Kotzian* ■ *Duane Mallicoat*

The insidious threat posed by chemical, biological, radiological, and nuclear (CBRN) weapons has significantly changed how U.S., allied, and coalition forces must now prepare for joint operations. CBRN survivability has become a game-changer in a way that no other threat has. To formalize the growing importance of this capability, the DoD modified an existing policy (DoD Instruction 5000.02, Operation of the Defense Acquisition System) and developed a new policy (DoD Instruction 3150.09, The CBRN Survivability Policy) to better ensure that program offices address CBRN defense requirements as early as possible in a weapon system's acquisition life cycle. These policies provide top-level guidance for weapon systems that are expected to survive and execute missions in a CBRN environment.

Hernandez *is the Joint Program Manager for Protection's director of MDAP support and CBRN survivability, supporting the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD).* **Kotzian** *is the DAU Mid-Atlantic Region Acquisition/Program Management Department chair.* **Mallicoat** *is the DAU Mid-Atlantic Region associate dean for Outreach and Mission Assistance.*



When compared with some of the other weapon system requirements that a program manager (PM) might consider to be more "high-profile," CBRN survivability and force protection have been viewed by some as less than totally successful in getting the necessary resources to better assure the inclusion of a CBRN capability in a weapon system's design. One outcome of such an approach is that many times CBRN defense solutions are handled as an afterthought and belatedly are required to be designed and integrated into an existing platform as a retrofit program. The impact is that the trade-space for most CBRN defense solutions becomes very limited later in a program's development life cycle, thereby creating higher development, production, integration, and supportability costs of the CBRN defense equipment, and sometimes forcing PMs to severely compromise the CBRN defense requirement. This typically results in a decreased capability to the warfighter and/or overall higher life cycle costs.

Meeting the Challenge

In response to these challenges, the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) established the Major Defense Acquisition Program (MDAP) CBRN Survivability Trail Boss Initiative in October 2009. The intent of this initiative is to enhance support to weapon system programs designated as DoD CBRN mission-critical and those requiring CBRN defense capabilities so the programs are better positioned to meet their entire set of CBRN survivability and force-protection requirements. The MDAP Trail Boss Initiative supports programs of all acquisition categories (ACATs), as well as non-DoD agencies, such as the Department of Homeland Security.

The initiative offers weapon system program offices a single point of contact to help facilitate the research, development, test and evaluation (T&E), procurement, delivery, and life cycle sustainment of affordable CBRN defense materiel solutions that meet the program's documented requirements. In doing so, the MDAP Trail Boss works closely with organizations internal and external to the JPEO-CBD to provide the weapon system program with a comprehensive CBRN defense solution. This methodology is envisioned to reduce the burden on weapon system programs by providing a "one-stop-shopping" philosophy to address all of a program's CBRN survivability requirements.

Additionally, this initiative offers program offices a subject matter expert (SME) resource that can be used throughout a weapon system's acquisition life cycle. This ensures that the CBRN survivability trade-space is maximized and developed in conjunction with other aspects of the weapon system platform, thereby providing a holistic, effective, and affordable solution.

Driving the CBRN Defense Herd

It was immediately recognized that the MDAP Trail Boss could not accomplish the initiative's objectives alone. Therefore, the resource commitment was made to assemble an MDAP Trail Boss Team, which is divided into five product areas, each led by a designated platform manager. The platform manager provides the day-to-day coordination and management of all activities required to meet a weapon system program's CBRN survivability needs. The five product areas are:

- Ground Mobile (e.g., tanks, infantry fighting vehicles, armored personnel carriers, tactical vehicles)
- Ships (e.g., destroyers, frigates, command ships, aircraft carriers)
- Aircraft (e.g. fixed-wing and rotary aircraft)
- Transportable (e.g., tents, transportable shelters, and individual gear worn or carried by the warfighter)
- Fixed site (e.g., permanent and semi-permanent buildings and structures)

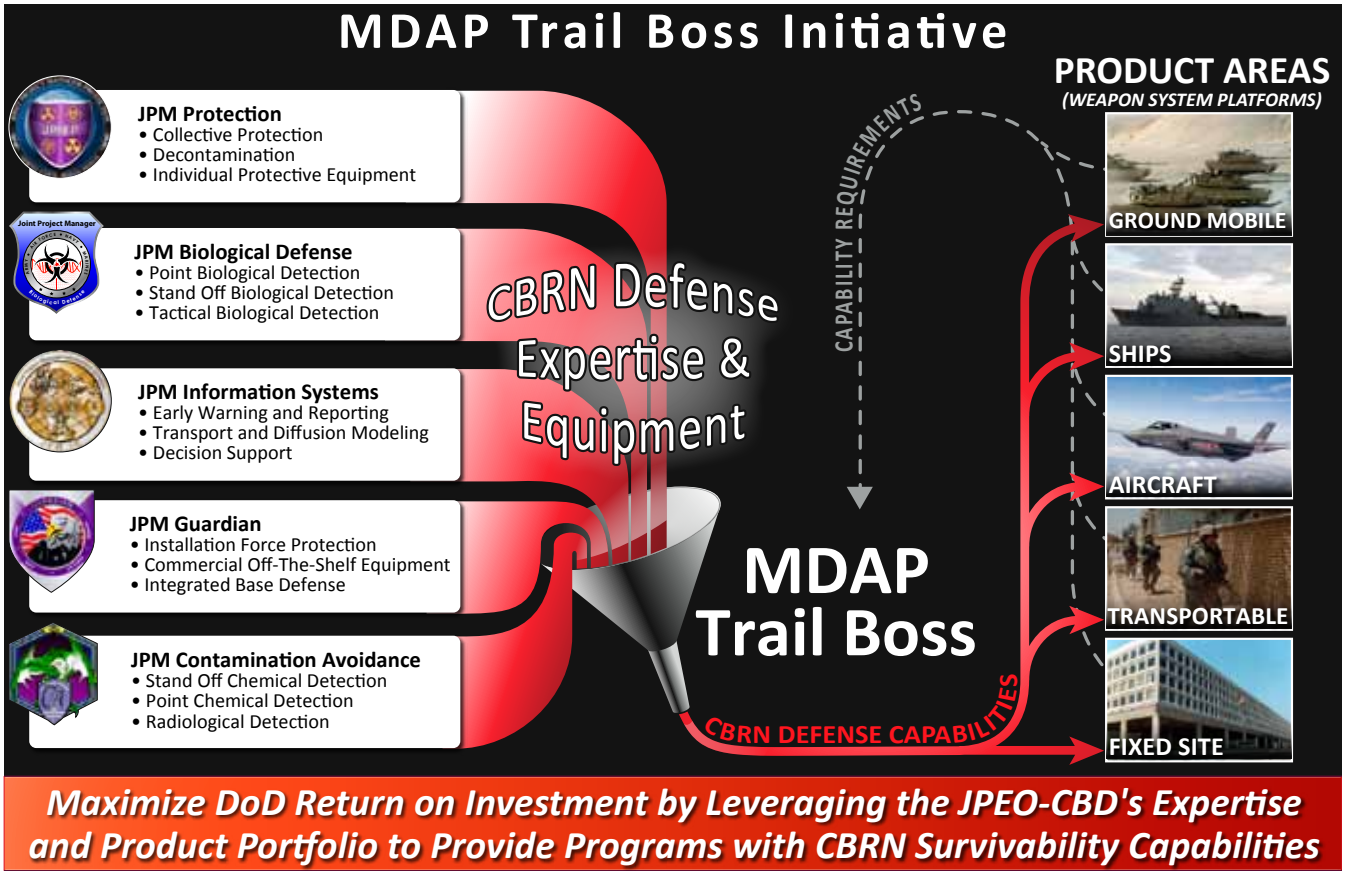
In addition to the platform manager, the MDAP Trail Boss Team consists of representatives from the systems engineering, logistics, T&E, science and technology (S&T), and modeling and simulation (M&S) functional disciplines. These functional representatives support the five product areas, when needed, and are drawn from the following five JPEO-CBD joint project managers (JPMs) to ensure that a comprehensive evaluation of a system's CBRN survivability requirements is addressed:

- JPM for biological defense (JPM BD): materiel solutions that detect, identify, warn, deter, and defeat biological threats
- JPM for information systems (JPM IS): integrated early warning capabilities, accredited hazard prediction models, and state-of-the-art consequence management, and course-of-action analysis tools
- JPM guardian: detection, analysis, communications, protection, response, and survey capabilities in support of installation force protection, civil support teams (CST), reserve reconnaissance and decontamination platoons, tactical units, and civil authorities
- JPM for nuclear, biological, and chemical contamination avoidance (JPM NBC CA): materiel solutions that detect, identify, warn, deter, and defeat biological, chemical, and radiological threats
- JPM for protection (JPM P):
  - Collective Protection (ColPro) equipment and systems that protect personnel and equipment within protected areas from chemical, biological, radiological, and toxic industrial materials
  - Decontamination systems, including the decontaminant and applicator
  - Individual Protection Equipment (IPE) that provides percutaneous (through the skin), inhalation, and ocular (eye) protection against chemical and biological threats
- Provisional JPM for radiological and nuclear defense (JPM RND): material solutions to counter radiological and nuclear threats

An overview of the JPEO-CBD "players" associated with the MDAP Trail Boss Initiative is depicted as follows:

In January 2011, the JPEO-CBD designated William Hartzell, the JPM P, to lead the MDAP Trail Boss Initiative in conjunction with his JPM P management activities. He summarized this new initiative as a way to "reach out to help all product and project managers meet their CBRN survivability requirements. We give program executive offices (PEOs) and PMs a 'one-stop shop' for *systems engineering, requirements realism, tactics, techniques, and procedures* (TTPs), and membership across all CBRN product areas. It is much easier to engage us early-on, prior to Milestone B, so we can assist you in meeting your requirements. It becomes time-consuming and expensive to backward integrate after Low Rate Initial Production (LRIP). So the upfront and early approach really applies here."

Early engagement is focused on implementing a sound systems engineering process throughout an acquisition program, which allows the MDAP Trail Boss Initiative to help minimize total life cycle costs, reduce schedules, and maximize performance.



A Two-Phased Process

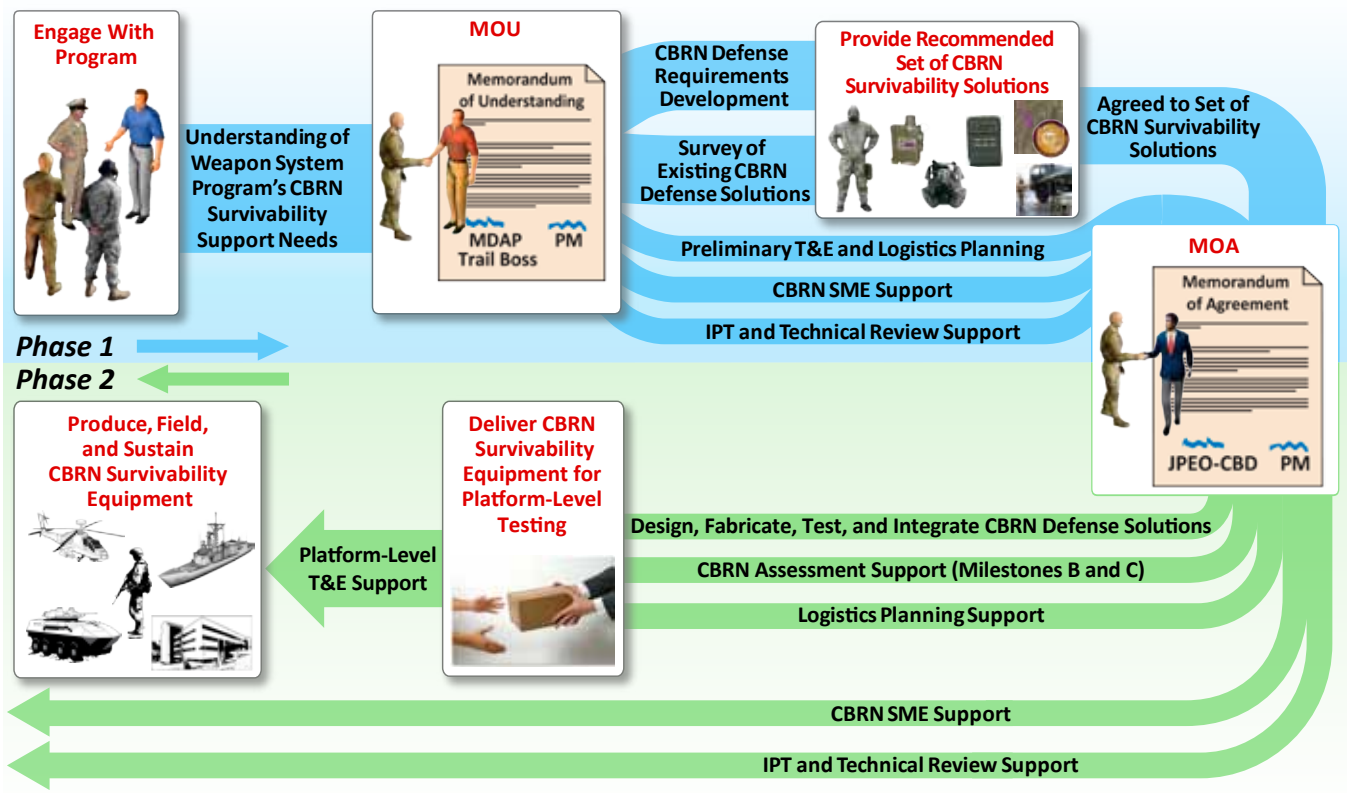
When it comes to actual implementation of the MDAP Trail Boss Initiative, a process tailored to each customer is used to meet the needs of individual weapon system programs. Typically, the support process consists of two phases, each designed to reduce the burden on weapon system programs.

The first phase consists of all activities necessary to identify the appropriate set of CBRN defense solutions needed to satisfy the weapon system program's survivability and force protection requirements. This phase begins with the appropriate platform manager engaging with the weapon system program to establish the level of required CBRN support. Any agreed roles and responsibilities, schedules, and deliverables are documented in a Memorandum of Understanding that may typically involve some or all of the following:

- Providing CBRN SME support
- Performing systems engineering analyses to develop CBRN-specific operational and technical requirements
- Performing systems engineering analyses to develop recommended CBRN-specific requirements for inclusion in the program's Capabilities Development Document (CDD) and/or the Capabilities Production Document (CPD)
- Identifying existing CBRN materiel solutions to best meet documented requirements
- Identifying performance gaps between existing materiel and technical requirements
- Performing trade-space analyses to optimize CBRN survivability capabilities within cost and schedule constraints
- Development of cost and schedule estimates to remedy identified gaps
- Helping develop tactics, techniques, and procedures to address identified gaps
- Identifying, assessing, and tracking risks
- Conducting preliminary CBRN T&E and logistics planning
- Development of CBRN defense architectures products

The second phase consists of all activities required to design, fabricate, integrate, test, field, and/or sustain the entire set of CBRN defense solutions. The MDAP Trail Boss' support during this phase is tailored to accommodate the weapon system program's cost, schedule, and performance requirements, and can range anywhere from basic on-call CBRN SME support to full CBRN materiel acquisition support. A Memorandum of Agreement identifies the agreed-to roles and responsibilities, schedules, and deliverables that may typically include some or all of the following:

- Development of the program's CBRN Assessment, required by DoDI 5000.02 and DoDI 3150.09 for Milestone B and C reviews
- Development, delivery, and sustainment of CBRN materiel solutions
- Providing CBRN T&E, logistics, and M&S support
- Providing integration and platform-level T&E support



MDAP Support Process, Tailored to Meet the Program's Needs

- Supporting relevant technical, programmatic, and milestone reviews
- Participation in relevant Integrated Product Teams (IPTs)
- Refining requirements and architectures developed in the first phase
- Providing CBRN SME support

There is no "typical" length of time associated with either of these phases. The intent is that the MDAP Trail Boss Team will work with the customer, who is the weapon system manager, to negotiate the level of involvement, deadlines, deliverables, etc., in a manner that supports the customer's expectations and requirements. In the same vein, the costs associated with involving the MDAP Trail Boss Team will need to be negotiated on a customer-by-customer basis based on the level of support being requested.



The flight respirator requirement will protect pilots against chemical and biological warfare agents.

Real-World Benefits

While the MDAP Trail Boss Initiative may sound like a wonderful idea, many PMs could have a somewhat reserved opinion of yet another requirement. So is the MDAP Trail Boss Initiative worthwhile? As an example of the benefits of this relatively young initiative, the Joint Strike Fighter (JSF) program, which has overall responsibility for developing and fielding the F-35 Lighting II stealth aircraft, stands out.

The MDAP Trail Boss Team has been working closely with JSF to meet the program's chemical and biological (CB) survivability and pilot protection requirements. The JSF Operational Requirements Document (ORD) requires that the aircraft must be designed to facilitate pilot survivability and must facilitate decontamination when exposed to CB agents. Additionally, the Joint Requirements Oversight Council (JROC) mandated pilot CB protection as part of the JSF survivability and force protection key performance parameters (KPPs). To address these critical requirements, the MDAP Trail Boss Team and its partners are developing a CB flight respirator and a comprehensive aircraft decontamination system.

The flight respirator requirement for the JSF program provides pilot protection (head, eye, respiratory, and percutaneous) against CB warfare agents, while maintaining hypoxia and anti-gravity protection necessary for F-35 pilots. In order to deliver an affordable, low-risk flight respirator solution, the MDAP Trail Boss Team, in conjunction with JPM P's Respirator Product Directorate and Gentex Corp., is leveraging work in progress on JPM P's existing joint service aircrew mask (JSAM) fixed-wing (FW) variant acquisition program. The JSAM FW respirator is being modified to meet the JSF's unique requirements such as integration with the F-35's pilot interface connector, pilot's helmet and personalized liner, helmet-mounted display, below-the-neck pilot flight equipment ensemble, and crush-proof hoses. The new JSF-specific respirator being delivered for the JSF LRIP decision is called the JSAM-JSF Variant.

In addition, the MDAP Trail Boss Team, in conjunction with JPM P's Protection and Hazard Mitigation Product Directorate, HDT Global, Production Products, and STERIS Corp., is developing a comprehensive aircraft decontamination system that allows the F-35 aircraft to be "cleaned" and safely returned to operation after CB contamination. This reduces or eliminates the impact of CB warfare hazards on the ability of the United States and its allies to execute required missions. As with the CB flight respirator, the MDAP Trail Boss Team is leveraging JPEO-CBD programs and other efforts to provide an affordable, low-risk aircraft decontamination solution. Existing shelter, collective protection, and decontaminant delivery technologies are being matured and integrated in new ways to provide simultaneous internal and external decontamination of the aircraft.

The JSF decontamination system is composed of an air beam shelter (with an incorporated CB containment liner structure) and an integrated decontaminant delivery system, providing hot air decontamination and biothermal decontamination capabilities for decontaminating CB agents, respectively. After contamination, the F-35 is positioned inside the lined shelter and the appropriate decontaminant is applied.

Negative pressure is applied inside the shelter to prevent any CB agents from escaping to the outside environment. Once the decontamination process is complete, the aircraft can be serviced (if needed) or flown on a mission.

The successful design, integration, and testing of JSF CB defense capabilities is only possible through close, coordinated activities between JSF and the MDAP Trail Boss Team.

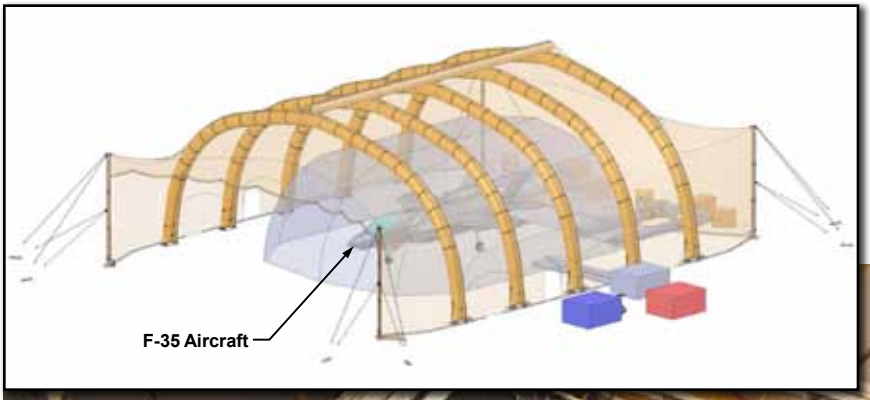
William Dooley, the JSF Mission Effectiveness Integrated Product Team Lead, says, "The JSF will be the first tactical jet aircraft with a comprehensive chem-bio pilot protection key performance parameter (KPP) and an aircraft decontamination requirement. Developing and demonstrating these capabilities is only possible through the outstanding, cooperative and fully integrated development activity currently being executed through the MDAP Trail Boss Initiative. Fielding a system that provides this capability will be a true testament to the commitment, dedication, and technical expertise of the design engineers across all the disciplines."

Our Team Stands Ready

As the potential of a CBRN attack looms over the development of DoD systems to counter asymmetric and traditional threats, the MDAP Trail Boss Initiative stands ready to support DoD program office CBRN priorities and requirements. In the words of the current Joint Program Executive Officer for Chemical and Biological Defense, Brig. Gen. Jess Scarbrough, USA, "I view the MDAP Trail Boss Initiative as a key component of this organization. By undertaking this initiative, the JPEO-CBD will be positioned to ensure our Warfighters receive the most technically advanced CBRN defense capabilities in a cost-effective and timely manner."

A multitude of requirements simultaneously seeks attention and resources from a PM and the program's team. For programs with CBRN survivability requirements, engaging the MDAP Trail Boss Team when the program's CDD is being developed will maximize the benefits to the program. This important resource complements warfighter protection and further enhances mission success.

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Left: Joint Strike Fighter Decontamination System Architecture (computer model)

Below: The Aircraft Decontamination System in the open position.





Should-Cost Management Tactics

Mark Husband ■ *John Mueller*

Since the 2010 release of the Better Buying Power (BBP) memo from Deputy Secretary of Defense Ashton Carter, Ph.D., (at the time the under secretary of Defense for acquisition, technology and logistics [USD(AT&L)]), the concept of should-cost management has been passionately discussed and debated by the acquisition workforce. Frequently asked questions include:

- What exactly is a should-cost estimate?
- Is a BBP should-cost review similar to the should-cost review in the Federal Acquisition Regulation (FAR)?
- How does my Service/agency implement should-cost policy?
- Is should-cost applicable to programs below the Acquisition Category (ACAT) I level?
- How (or why) does should-cost apply to programs outside the investment accounts?

But without a doubt, the No. 1 question asked about should-cost management has been, "What's going to happen to the funding delta between the should-cost and will-cost estimates?"

Husband *is a DAU professor of cost analysis with 17 years of acquisition experience in cost estimating, systems engineering, and research and development project management.* **Mueller** *is a DAU professor of program management with 26 years of acquisition management experience in Air Force and joint programs.*



The AIM-9X Sidewinder Air-to-Air Missile program was an early adopter of should-cost management.

Getting Into a Should-Cost Mindset

Experienced acquisition professionals are familiar with the various types and accuracy of program cost estimates. The should-cost concept asks the program manager (PM) to look at these estimates differently. Rather than accepting the estimates as foregone conclusions, the core principle of the BBP should-cost is to ask the PM to adopt a different mindset toward cost estimates. Under BBP, programs must continuously fight to lower costs wherever and whenever that makes sense. While lowering cost is a primary objective, a program should not trade away proven practices just to reduce near-term costs. A PM must retain a long-term view. The right mindset means looking for savings throughout a program's life cycle, not only in development and production, but also during the Operations and Support (O&S) phase. Finally, a should-cost mindset focuses the entire program office team on delivering the required capability—no more and no less—to the warfighter on time and within budget.

Additional Implementing Guidance

Following the original BBP memo, several additional policy memos clarifying the should-cost effort were released by the USD(AT&L), the under secretary of Defense-comptroller/chief financial officer, and each of the Services. These memos outlined implementation strategies, methods, and techniques for identifying should-cost savings. Articles on should-cost management have been written, briefings, presentations, and seminars conducted, and templates for addressing should-cost in Defense Acquisition Board (DAB) and Defense Acquisition Execuive Summary (DAES) reviews have been released. But perhaps more important, a small number of programs have completed initial should-cost reviews in accordance with the original guidance and have briefed their should-cost estimate to the Milestone Decision Authority (MDA).

Implementing Should-Cost in Unexpected Places

One early adopter of should-cost was the AIM-9X Sidewinder Air-to-Air Missile program, led by Capt. John "Snooze" Martins of PMA-259 at Naval Air Station Patuxent River, Md. Capt. Martins presented his team's accomplishments at the 2011 Program Executive Officers/Systems Command conference and has been a guest lecturer at the PMT 402 Executive Program Managers Course at DAU Fort Belvoir, Va.

Much of the attention on should-cost has focused on early phases of the acquisition life cycle where requirements trades, competitive pressures, and contract incentives can have major impacts on overall program costs. Applying this "upfront and early" criterion, the AIM-9X program would seem to be an unlikely candidate for should-cost success. The program is well into production with a stable design and a single production source. But as is the case with many complex DoD acquisitions, a "quick look" assessment fails to reveal the full picture. As the AIM-9X story reveals, should-cost management can be applied to any DoD activity, including Services and government costs; it's up to the PM to determine the types of should-cost initiatives that are appropriate for a given program.

The Back Story

The AIM-9X Sidewinder missile program recently transitioned from a single procurement into three distinct acquisition programs. The initial AIM-9X program, the Block I system, is more than 10 years old and needed component upgrades to address obsolescence issues. While these upgrades increased the missile's service life and effectiveness, the upgrades also increased the missile's unit cost. In mid-2010, the upgraded configuration became a separate program, the AIM-9X Block II. Later, based on the success of the AIM-9X Block II, a new start program called AIM-9X Block III was funded to begin in 2013 to further enhance missile range and provide upgraded computers. The AIM-9X Block II reached an on-time (and favorable) Milestone C decision on June 24, 2011. At this milestone review, USD(AT&L) directed the initiation of a should-cost effort on the Block II program before low-rate initial production (LRIP) lots 1 and 2 could be placed on contract.

Martins already was dealing with the typical challenges associated with managing multiple ACAT IC programs. Against this backdrop, performing a should-cost effort might seem to be "a bridge too far." Capt. Martins' takeaway from AT&L's direction:

> Although some might not think a weapon system that has been fielded for 10 years could yield significant savings, all programs that are spending money can find efficiencies and identify savings, regardless of the life cycle stage or budget size. The intent of BBPi [initiative] is for all program managers to reduce costs across the DoD acquisition portfolio. For the AIM-9X program, the Block II procurement was just beginning to produce the new components and entering a steep part of the learning curve. The team identified that area as having the greatest opportunity for savings, so that's where the AIM-9X should-cost team focused.



The Tasking

As with most large DoD acquisitions, there were multiple reviews and decision meetings with OSD senior leaders prior to the AIM-9X Block II Milestone C decision. At one of these meetings, then Acting USD(AT&L) Frank Kendall designated the program an ACAT IC, with the Navy as the lead Service tasked to conduct the Milestone C Navy Program Decision Meeting on June 24, 2011. Mr. Kendall conducted an in-process review (IPR) the day prior to the Navy Milestone C on June 23, and, although he approved going to MS C, the IPR Acquisition Decision Memorandum (ADM) stated:

> Prior to the Lot 11 LRIP (fiscal year 2011) contract award, the Navy will submit a detailed should-cost estimate for the program for my review. This estimate will be based on implementing a cost reduction strategy with the goal of driving aggressive incremental decreases in the Block II missile costs, particularly unit price. The estimate will include discrete bases for reduced missile costs, including component upgrades, manufacturing process streamlining, plant improvements, second-sourcing of components, test efficiencies, and sustainment initiatives. Each lower cost basis will be fully defined with corresponding estimates for specific cost impact.

With this ADM, Martins had the direction and motivation to begin his should-cost journey. Now he just needed a means of identifying and implementing should-cost savings.

AIM-9X Implementation

Within the construct of the BBP directives or initiatives, a favorable should-cost result depends upon the program office team's ability to find savings without reducing the system's capability to do its mission or increasing program risk to an unacceptable level. An obvious place to start looking for these savings is the location of your largest amount of "spend." For most DoD acquisition programs, the largest total amount of spending is in O&S of the fielded systems; however, the outlay of these dollars is largely outside the PM's direct control. To find near-term savings, the PM needs to look closest at spending within his span of control. As a result, most should-cost efforts thus far have focused on programs in development or entering production.

A word of caution: Actions to obtain savings in the research, development, test and evaluation and procurement accounts can generate immediate positive impacts, but at the same time generate long-term costs that exceed the short-term savings. These changes also could negatively impact the system's overall effectiveness. Frequently cited examples of shortsighted cuts include reducing training, cutting spare parts orders, or deferring data rights purchases.

For the AIM-9X program, the program office developed a four-step methodology to produce its should-cost estimate.

The first step was to break down program funding and cost drivers to identify the areas with high savings potential. In other words, follow the money. Unlike most weapon programs, the majority of life cycle funding for a munitions program is usually procurement as operation and maintenance funds are comparatively small. As a result, the AIM-9X team focused its initial should-cost effort on reducing the weapon's unit cost.

The next step was identifying and prioritizing cost savings opportunities. The team's processes included a brainstorming effort with multifunctional participants to identify all possible sources of future savings. The savings ideas were organized into a fishbone diagram to group them by category, based on guidance that "there is no such thing as a bad idea" during the brainstorming stage. The broad group of participants included both government and contractor personnel. More than 100 possible cost-reduction initiatives were identified and prioritized based on their probability of success and possible payoff.

Using this analysis, the third step was to create a plan of action and milestones (POA&M) to pursue selected cost reduction initiatives based upon timelines that made the most sense. This is where the really hard work began. Specific actions were designed and implemented to achieve the desired savings in the future buys of the AIM-9X missile. Table 1 lists the

team's initiatives ranked by their ability to produce savings to the program.

Table 1. Cost Savings Initiatives

Title
Increment 1
Accelerate Production Deliveries (Lot 11)
Lot 11 Contract: FPIF (AOTD)
Increment 2
Accelerate Production Deliveries (Lot 12)
Lot 12 Contract December Option / FPIF (AOTD)
Reduce SEPM/Overhead
Automated AUR Test at FACO
AOTD Data Link Test Equipment Upgrade
AOTD Vibe Station Upgrade
AOTD Inner Housing Assembly Test Equipment
Increment 3
Lot 13 Contract Type: FPIF (entire missile)
Consolidate Shared Support Functions Across Contracts
Match Production Spec Requirements to Capabilities
Improve nLight AOTD Laser Factory Reclaim/Rework
Improve nLight AOTD Laser Solder Fixtures
Automate nLight AOTD Laser Test Station
Improve ELCAN AOTD Transceiver Yield
Cryoengine Seal Improvement
Increment 4
FY14 Multi-Year Contract
Package HW ECPs in 2 year centers
Synchronize Contract Award Timelines
Contract to Price, Not by Element
Synchronize Parts Quality Requirements Across USG Customers
Streamline Contractor Response to Quality Escapes
Reduce AOTD Performance Requirements
Bundle vendors: datalink, rocket motor
Increment 5
Supply Chain Management for Competition
Affordable CATM 1: Optimize CATM BIT
Affordable CATM 2: Hardware Optimization

Finally, the projected savings each year were used to create should-cost targets for the next 5 years of procurement. These targets became the government's price position for contract negotiations. Figure 1 represents some of the key results from the should-cost effort.

Following the completion of the should-cost work, Kendall was briefed 45 days after the original Acquisition Defense Memorandum. The results of the should-cost effort were decreased unit costs for the next two buys of missiles with potential future savings based on the learning curve for the program. With this data in hand, Kendall approved the government's position on the LRIP 1 contract prices for Lot 11 of AIM-9X Block II missiles.

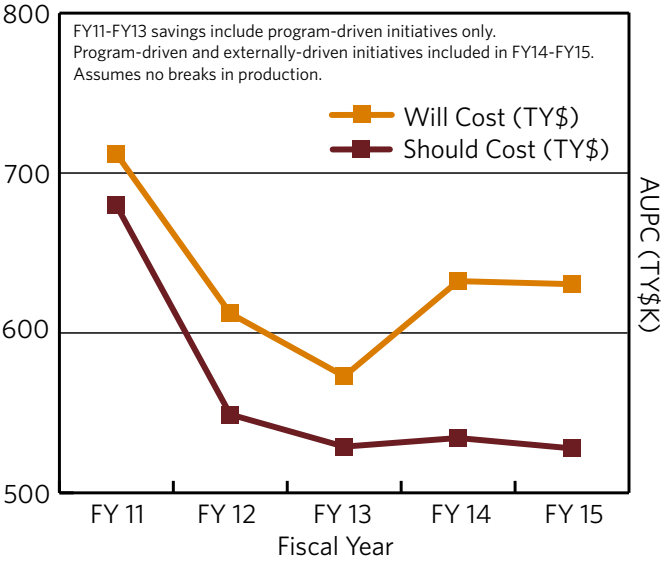
Answering the Big Question

Creating a should-cost estimate is a significant effort for the PM, but executing it to realize the savings is even more important—and perhaps more difficult. It's important to understand that the window for savings is transient—all the effort that goes into creating a new, lower-cost target is lost if the savings can't be realized. So back to Martins: Have you been able to lock in these savings and what is the likely potential use for these funds?

> The program has had two successful negotiations and has contracted for two lots of missiles awards since the start of the should-cost effort. The initial contractor proposed unit prices associated with both lots exceeded the should-cost targets. After concluding negotiations, the final Lot 11 $664K unit price was 43 percent less than the projected unit price a year earlier. The subsequent Lot 12 unit price was further reduced to $488K. The $21M Lot 11 savings allowed the DoD to purchase 28 additional units, invest in additional CRIs [cost reduction initiatives], and pay pop-up obsolescence bills. Similarly, Lot 12 savings allowed the Navy to purchase 25 additional units, invest in additional CRIs, and enabled the program to effectively deal with the inevitable unexpected bills during the execution year.

The net result for the AIM-9X program was that the results from the team's should-cost work stayed within the program

Figure 1. AIM-9X "Will Cost" Vs. "Should Cost"
Then-Year Dollars, Program Quantities



and provided additional benefit to the warfighter in both quantity and quality of the product. This result is consistent with the intent of the AT&L Better Buying Power initiatives.

Final Thoughts

What final words does Martins have for other acquisition programs as they chart their own should-cost path?

> In addition to using should-cost evaluations to become a better buyer, AT&L leadership is especially focused on cost reduction initiatives based on competition. Top-level competition for the AIM-9X product line was not feasible with Raytheon as a sole source prime. However, alternative potential sources of competition can be found lower in the supply chain. An attractive possibility is taking an expensive component, competing it, and providing it to the prime as GFE [government-furnished equipment]. This requires government data rights, so you should anticipate that many should-cost discussions with leadership will involve data rights.
>
> As an additional note, PMs must of course be very cautious about how they describe potential should-cost program savings. It is not OSD's intent to cut program budgets based on potential cost savings, but instead to reallocate or return to Treasury those savings only after they are realized. When briefing audiences both internal and external to DoD, it is critical that PMs provide sufficient detail about the savings initiatives, including their timelines as well as assumptions and associated risks.

Thanks to Capt. Martins for sharing his experiences from the AIM-9X should-cost effort.

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Additional Should-Cost Management Policy and Guidance

The guidance on Should-Cost Management in the original BBP memo was deliberately broad in recognition that, to be successful, the concept would need to be further developed and embraced by the Services and key leaders in the acquisition community. OSD(AT&L) led a joint implementation team that included members of each Service to further refine and develop should-cost management principles. Those principles have been codified and promulgated to the acquisition workforce in the following guidance documents:

- USD(AT&L): "Implementation Directive for Better Buying Power—Obtaining Greater Efficiency and Productivity in Defense Spending," Nov 3, 2010
- USD(AT&L) and USD(C): "Joint Memorandum on Savings Related to Should-cost," Apr 22, 2011
- USD(AT&L): "Implementation of Will-Cost and Should-Cost Management," Apr 22, 2011
- USD(AT&L): "Should-Cost and Affordability," Aug 24, 2011
- Army: SAAL-ZR: "Army Implementation of USD(AT&L) Affordability Initiatives," Jun 10, 2011
- Air Force: SAF/FM & SAF/AQ: "Implementation of Will-Cost and Should-Cost Management," Jun 15, 2011
- Navy: ASD(RDA): "Implementation of Should-Cost Management," Jul 19, 2011

Farewell, John—Welcome, Ben



John Bell

This issue of *Defense AT&L* magazine marks a change in the managing editorship. John Bell, whose editing skills have shaped the magazine since early 2011, has left for another position with the Defense Department. Benjamin Tyree, formerly a senior editor at Defense Acquisition University and editor of the DAU Course Catalog, is the new managing editor. Ben has had a substantial career in journalism, as a newspaper and newsletter editor and magazine writer. We wish John well in his new endeavors and welcome Ben on board as the new helmsman. Ben's e-mail address is Benjamin.Tyree@dau.mil.



Ben Tyree



Why Is This Acquisition Strategy Stuff So Important?

Brian Schultz ■ *David Dotson* ■ *Tom Ruthenberg*

Development and implementation of the program acquisition strategy is clearly one of the most important tasks for a DoD program manager (PM) and the program office integrated product team (IPT). The recent *Defense AT&L* article, "The Acquisition Strategy" (May–June 2012) shared insights on teamwork, critical thinking, and pitfalls to avoid in developing the strategy. In this article, we will address some best practices, look at the state of affairs concerning acquisition strategies, and offer thoughts on initiatives that either could help or are helping PMs produce better results.

The consequences of a poorly developed acquisition strategy can be significant, ranging from inefficient program execution to cost and schedule growth, to severe program performance issues, including baseline breaches and program termination. One of the key elements of the acquisition strategy is determining where a program should

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enter the acquisition system and how much risk is associated with the procurement. A 2005 Government Accountability Office (GAO) study, *Assessments of Selected Major Weapon Programs* (GAO-05-301, March 2005), found that acquisition strategies having programs entering the Engineering and Manufacturing Development (E&MD) acquisition phase too early with immature technology incurred development cost increases of 41 percent and production cost increases of 21 percent. Conversely, programs that used mature technology incurred development cost increases of 9 percent and production cost increases of less than 1 percent. The study also highlighted how the majority of the 54 programs assessed were costing more and taking longer to develop than planned.

Recent DoD initiatives have addressed process and policy changes to ensure that programs consider and analyze key elements in the development of the acquisition strategy. While the DoD leadership emphasis is clear, we believe that producing high-quality and comprehensive strategies will continue to be a major challenge. This challenge is due to the nature of the task, which involves a very complex and dynamic environment that, when coupled with the requirement to analyze the costs/benefits of several factors, can drive different alternatives.

The June 23, 2011, memorandum, "Improving Milestone Process Effectiveness" outlined changes to the DoD milestone review process which provides the Milestone Decision Authority (MDA) with a separate, pre-milestone B and C review that focuses exclusively on the acquisition strategy, request for proposal (RFP), and other programmatic documents. Program Managers (PMs) must now develop, present, and defend their acquisition strategy and RFP at a point where changes to the proposed strategy (and documents) will not be disruptive or impractical to an ongoing procurement action. This process change clearly highlights the importance of the acquisition strategy and expectations for a thorough review by the acquisition management decision chain. But, do program teams have the right resources, knowledge, and skills to meet the need?

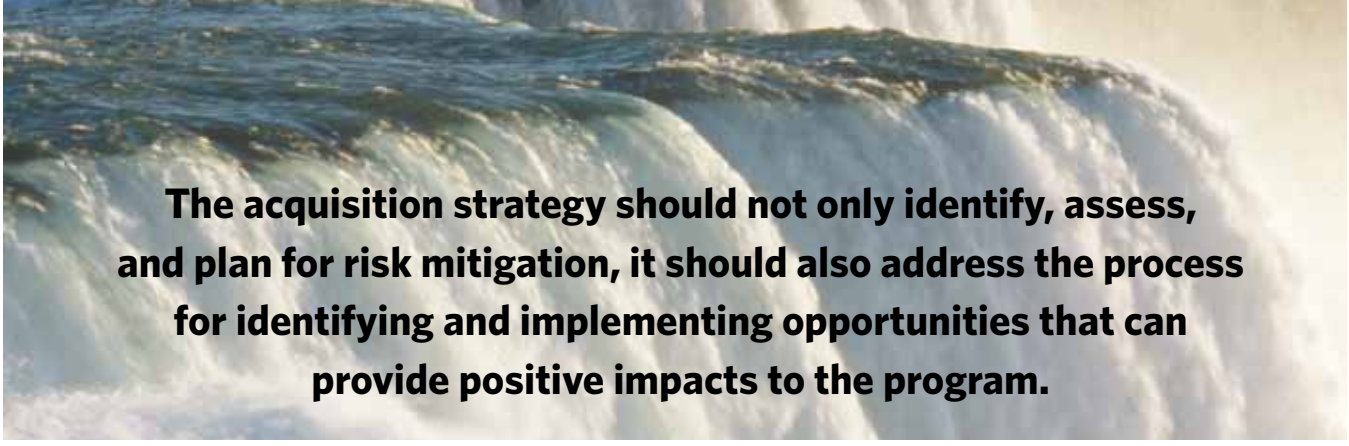
Let's start with what is readily available to help develop acquisition strategies. There are several online resources (Defense Acquisition Guidebook, Defense Acquisition Portal, PM's E-Tool Kit, etc.) that provide guidance on developing an acquisition strategy. The Better Buying Power Gateway on the Defense Acquisition Portal has links to all the new document templates and has the latest policy and training information.

Within some agencies, there may be local resources and staff experts available to assist with acquisition strategy development. Organizations may have "gray-hair" experts available on staff who can help guide the IPTs and participate in strategy review sessions. Some acquisition agencies (e.g., Air Force Product Centers) are required to obtain support from the local Acquisition Center of Excellence staff that is chartered to assist Program Office teams. Program Offices also can seek assistance from the Defense Acquisition University in the form of mission assistance support within each of the DAU regional campuses.

In addition to the online and support resources, there are many best practices that should be considered. These practices may not fit every program and should be tailored to the specific needs of the situation. A common thread throughout all these practices is the idea of upfront, early planning. The following best practices are highlighted as some of the most beneficial, based on our collective experiences:

- ***Ensure adequate time and resources are allocated to the task***
  Developing a comprehensive acquisition strategy for a complex system will take time and must include participation from the functional area experts and stakeholders (e.g., PM, system engineer, logistics, contracting, legal, etc.). The participants should fully understand their roles, expectations, and program constraints so they can plan well in advance for such a critical program event. Plan adequate time to conduct analytical efforts and then interpret, refine, and vet the results. An upfront time investment can pay dividends in the form of a more credible and executable program strategy.

- ***Conduct a Procurement Planning Conference (PPC)***
  One of the key tenets of acquisition strategy early planning should be to convene a PPC in order to:
  - —Identify key issues that require action and resolution.
  - —Establish key milestones, assign responsibilities, and get buy-in from the stakeholders on the plan of action and milestones. Remember that the release of a contract solicitation is dependent on approval of the acquisition strategy, so start early enough to support the planned solicitation release date.
  - —Develop a Procurement Planning Agreement (PPA). The PPA is like a charter, documenting team buy-in regarding the program schedule and



The acquisition strategy should not only identify, assess, and plan for risk mitigation, it should also address the process for identifying and implementing opportunities that can provide positive impacts to the program.

responsibilities. The PPA should be a living document that guides the team and is updated as events are accomplished or delayed.

- ***Use robust Systems Engineering (SE)***
  The importance of a sound SE approach in acquisition management has been receiving more emphasis in DoD. The SE's role in acquisition strategy development is crucial, especially for developmental efforts. To the extent practical, the program office should leverage the engineering expertise and analytical efforts of industry since performance, cost, and schedule tradeoffs may be unique to a contractor's design. A few key areas the SE team should address include technical risks, technology readiness, technical data, and planned dates and types of major technical reviews. The SE team also should address logistics and sustainment aspects of the technical strategy, including reliability growth, maintainability, and design influence on life cycle cost. Note that all of this is consistent with the content that engineers should be addressing in the new Systems Engineering Plan (SEP) outline.

- ***Manage risks and opportunities***
  The approach for dealing with program risks should be one of the first steps in the acquisition strategy development since these risks could heavily influence the selected strategy. Addressing risks also helps focus analytical efforts to shape the acquisition strategy. The acquisition strategy not only should identify, assess, and plan for risk mitigation, it also should address the process for identifying and implementing opportunities that can provide positive impacts to the program. Opportunity management is the process to exploit opportunities based on its estimated likelihood and benefit. Many organizations have institutionalized a combined risk and opportunity management program that has resulted in significant benefits, some of which may not have occurred without a combined effort.

- ***Use of peer and/or gray-hair reviews***
  Obtaining the advice and support of senior acquisition leaders and staff experts is an excellent method to get feedback on the strengths and potential weaknesses of your approach. Some organizations may require a "quick-pass" briefing or working-level review prior to senior leader review of the acquisition strategy with the objective of identifying and resolving issues at the appropriate level. PMs should recognize that it may take more than one review to get a credible product with stakeholder buy-in. If practical, also consider getting appropriate industry inputs.

These resources and best practices are useful, but we believe there are additional items that could be considered to improve this critical acquisition task. The need for improvements in acquisition strategy development was noted as one of the top three issues (second behind oversight) in the Defense Acquisition Performance Assessment (DAPA) Report of 2006. This comprehensive study of the acquisition system, chartered by the acting secretary of Defense in 2006, addressed systemic problems and recommended improvements in all areas of our acquisition system, many of which have or are being implemented.

The following is a list of our thoughts on areas that either could or are having a positive impact on the workforce's ability to develop sound acquisition strategies:

- ***Reduced cycle time strategies for both acquisition and requirements***
  One of the key strategy development criteria should be the time it takes to get the capability to the warfighter. While we have seen a push for reduced acquisition cycle time in policy guidance, this mandate also could be considered as part of the requirements generation process. The requirements development community could institutionalize a faster fielding mandate by making time to initial operational capability, the key focus of the initial requirements statement. Note that the new Joint Capabilities Integration Development System (JCIDS) update in January 2012 supported this concept in the context of deliberate, emergent, and urgent operational requirements.

  The DAPA report clearly highlighted this recommendation, referring to it as "Time Certain Development." This idea is different than evolutionary acquisition since defined start and end dates are established and performance and costs are traded off to support the need date. Capabilities assessed as moderate and high risk may be deferred to later increments of system upgrades or deferred indefinitely. Supporting processes (budget, source selection, systems engineering, etc.) are adjusted to support the schedule.

Finally, as part of this paradigm change, performance metrics for key functional areas (e.g., contracting lead-times, risk and trade-off analysis, and cost estimates) that support reduced cycle times should be established, measured, and institutionalized. A few pilot programs could be selected to test this approach before broader implementation. This time-certain development concept currently applies to defense business systems acquired via the business capability life cycle model, as documented in Directive-Type Memorandum 11-009, Acquisition Policy for Defense Business Systems, issued June 23, 2011, by the principal deputy under secretary of Defense (AT&L).

- ***Guidance on analytical methods***
  Given the renewed importance of cost, schedule, and performance trades, there may be benefit in establishing guidance on analytical and cost estimating methods to ensure that trade-off analyses are based on sound data and methods. This is not to suggest that only one approach should be used for all situations, but establishing expectations for appropriate analytical rigor should be considered. This should be a joint effort with industry since DoD will often be relying heavily on contractor's data and methods as part of this process, including the cost trade-off analysis as part of the Milestone B review.

- ***Best practices and communities of practice for development of the acquisition strategy***
  Our experience suggests that collaboration with others who have skills and experience in the task at hand can be a great tool to help teams navigate through complex tasks. This could also apply to developing the acquisition strategy. Methodologies, lessons learned, and best practices specific to the type of acquisition (e.g., weapon systems, services, information technology, etc.) could be developed and made available online. Additionally, communities of practice that address acquisition strategy development may be useful in sharing valuable information as teams prepare for and execute this task.

Developing the acquisition strategy is a critically important task. It is clearly the key document that has far-reaching implications for acquisition outcomes. There have been many attempts over the years to reform the acquisition system and many of the reforms have targeted topics directly linked to acquisition strategies. Developing and seeking approval of the strategy is hard work and expectations for innovative and cost-effective strategies have increased. While we are getting much better at this task, we must continue looking for opportunities to improve. There is no "silver bullet" that will make this process more effective or any easier. However, we believe that efforts to improve the DoD capability and process for acquisition strategy development can pay big dividends in the form of better and more efficient outcomes.

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ACQUIPEDIA

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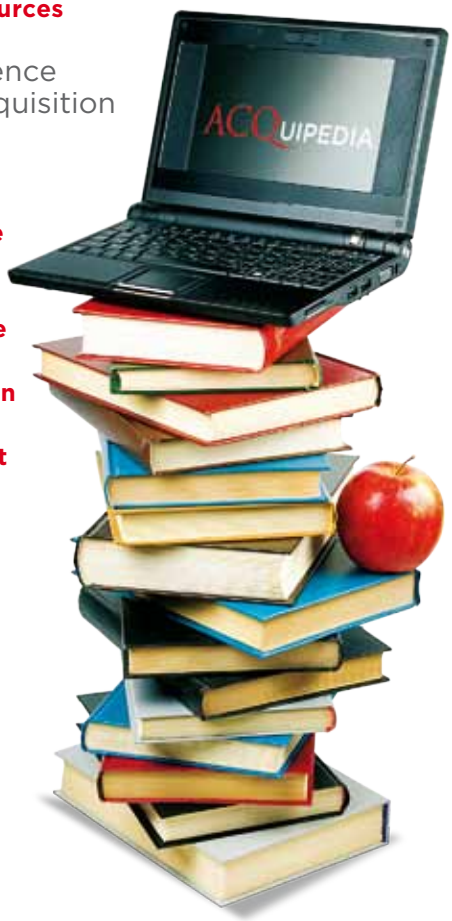
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Marching an Army Acquisition Program Toward Success



Col. David W. Grauel, USA
Col. Vincent F. Malone, USA
Col. William R. Wygal, USA

Negative headlines are rarely balanced with news of successful Army acquisition programs. The Army has hundreds of acquisition programs, many of which are successful. As students at the Industrial College of the Armed Forces (ICAF), we conducted a research project to assess successful Army acquisition programs in order to identify characteristics that led to their success. Our findings can be adopted by other program teams, within the current acquisition construct, to improve their likelihood of success.

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Programs Assessed

The research team selected five programs from a list of more than 50 programs provided by Army program executive offices (PEOs) to the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology. After excluding quick-reaction capabilities and rapid-acquisition programs, which do not follow a traditional acquisition process, we chose the following programs as the representative sample for our research:

- Force XXI Battle Command Brigade and Below (FBCB2)
- C-27J Joint Cargo Aircraft (JCA)
- Non-Maneuverable Canopy (T-11) Personnel Parachute System
- UH-72A Lakota Light Utility Helicopter (LUH)
- Warfighter Information Network–Tactical (WIN-T)

The research team used a structured interview process with three groups of stakeholders: Army program management teams, their industry partners, and external stakeholders, including the Office of the Secretary of Defense.

As the interviews progressed, six characteristics emerged that significantly improved the chances of success for these programs. Government program manager (PM) leadership, and the program team environment they fostered, was the single overarching characteristic that had the greatest effect on the success of these programs. Furthermore, the leader's ability to foster an environment that allows a program to thrive depends upon having the right people, achieving unity of effort, being product focused, maintaining stable requirements and employing the right program approach. Each program management team implemented these elements in a different manner, yet all used a combination of them to succeed. We address each of these characteristics in turn.

Leadership: The Common Denominator

"This may sound simple, but the first characteristic that separates the really successful PMs is their leadership. They set the tone, they should be decisive, and have a vision."

Effective leadership forms the foundation of any successful program, and is therefore the basis for all other elements that follow. The best analogies to arise from the interviews are that of the conductor or the task force commander. Both are knowledgeable in their crafts as they synchronize the efforts of those who support them. They know what their subordinates do, but are not necessarily the experts in the specific tasks. The most successful acquisition leaders are the people who know what "right looks like," but realize they don't know everything. They are driven, but relatively humble. They are open to the opinions of (and willing to be influenced by) others. They demand open, honest communication so that decisions are not suboptimized. The leaders of the programs we assessed exemplified these behaviors.

This is not to say their efforts are perfect, or that their programs are problem-free. They all have challenges. The difference is that they have created environments where their government/industry/stakeholder teams are able to respond appropriately, and deliver.

"The purpose of a PM is to move your program forward. The guys who are usually successful are the guys who just have it in their heart that they own their program, and in their three or four years on the program they move their program forward. Not just play the piece, but to play it all the way to the crescendo."

The Right People in the Right Place at the Right Time

"All successful PMs will likely feel like they can put their team up against anyone."

To take the analogy of the task force commander one step further, just as a good battlefield commander senses where he needs to go to best influence the battle, so do effective acquisition leaders know when and where to focus to best influence their program. Having the right people on the team provides the freedom to go where they need to go. The right people free up the PMs to focus less on the day-to-day execution, and more on those things only they can do, thereby having a greater impact on the program's success over the long run. The right people are able to advise the PM appropriately, then execute their tasks effectively once a decision is made.

While some may consider skills and experience to be one in the same, one PM cautioned:

"The acquisition background of your logisticians and engineers, the backbone of the PM Office, must be high. Experience is the key. Training cannot be substituted for the value of acquisition experience."

Another point that surfaced during the course of our interviews was affirmation of the criticality of our assistant program managers (APMs). The capabilities of these junior leaders are just as important as a PM's set of qualifications, although the latter have often been the focus of other studies of program success. The successful programs we assessed were characterized by PMs who delegated appropriate programmatic authority down to their APMs, and ensured that these subordinates knew they were responsible for the program from an execution (cost, schedule, performance, and risk) perspective. This is taking good people and utilizing them in a manner that provides the best chance for achieving program success.

Unity of Effort: It Takes a Tribe

"They (PMs) really understand how to keep the whole program—their side, the contractor side, the user side, the Pentagon side—synchronized as sort of the conductor of the whole program."

This collective approach to successful product development was echoed time and time again throughout this research. Program management teams spoke in terms of unity of effort, where all members of the team had to pull together toward a common goal to achieve success. For the majority of the



Communication kept all members informed of challenges, progress, and goals. It was the glue that held the team together and kept it moving toward the goal.

program management teams, effective communication was the key to creating the common understanding needed for unity of effort. Communication kept all members informed of challenges, progress, and goals. It was the glue that held the team together and kept it moving toward the goal.

Industry partners referred to the value of teamwork in product development efforts. From an industry perspective, that teamwork was enabled not only by communications but also by mutual understanding and a sense of partnership. Effective communication involves candid conversation—the ability to pick up the phone and call a counterpart to discuss both good and bad results.

Each of the senior leaders interviewed also spoke of the importance of teamwork. One cautioned not to rush to failure, and to invest the time up front to understand the needs and capabilities of each member of the team. The early investment of time spent building the team and cultivating mutual trust pays big dividends when the pace of development picks up after product launch.

Product Focus: Keeping Your Eye on the Ball

Miles of hallways, thousands of offices, and legions of employees await virtually every development program the Army launches. These Pentagon offices are created to review documents, identify risks, and prevent mistakes. No doubt, Pentagon staff sections are good at what they do, but they are not designed to speed a capability to the force. However, on the wall in virtually every office are pictures of systems successfully fielded to users. These pictures are the key to navigating the labyrinth of Pentagon oversight agencies. To succeed, product developers must focus attention on near-term capabilities rather than long-term concepts.

The same is true throughout the acquisition system. Program management offices generally referred to this as being product-focused. Across the board, it was a key to success because it created a common reference point and near-term goal. It tied the user to the process, thereby helping create paths around obstacles that might otherwise have derailed the programs. Even the most rigid staff sections are sometimes willing to compromise if they believe flexibility might result in the near-term delivery of a needed capability.

For the industry partners, product focus helped create the momentum that reduced the time to get the product to market. Speed wins from an industry perspective. Programs that are slow to develop often become bill-payers during Pentagon budget drills, and unsatisfied customers often walk away. For these reasons, a unified focus on the delivery of a product or capability is an essential element of any successful development effort. External stakeholders also recognize the value of maintaining a product focus. Current policy and directives promote the use of shorter timelines to encourage more realistic requirements. They also emphasize incremental development so that stretch requirements can be deferred to future increments, giving technology more time to mature. Best practices also encourage the early development of prototypes to illustrate that concepts are in fact achievable. For external stakeholders, there is no substitute for the knowledge gained through demonstrating the actual hardware in a development effort.

Realistic and Stable Requirements

"The requirements are the foundation upon which the program is built, and if that foundation is weak, the whole house of cards comes tumbling down."

If asked to enter into a binding agreement to deliver an unspecified product in a fixed period, most reputable businesses would decline the offer. Nevertheless, at times, that is exactly what DoD asks of the defense industry. Granted, the capabilities desired must be documented at the start of development, but that is often just a launch point on a longer journey. It doesn't take long before the word of a new capability gets out, and new requirements creep in.

The successful program management teams in this study were all well aware of the dangers of unstable requirements. Many knew from experience that unanticipated requirements could easily turn an executable program into a poster child for failed acquisition. For that reason, most attributed much of their program success to reasonable and stable requirements. Some reduced their risks of new "discoveries" by incorporating only mature technologies. However, this stability was never a given. Success for most came down to having a strong leadership team that resisted attempts to incorporate new requirements, and a flexible strategy that allowed for emerging needs to be deferred to later increments.

Industry teams put an equal value on stable requirements. Stable requirements allow industry to plan and allocate resources most efficiently. Getting the program right up front was a common theme among the industry partners in this study.

Requirements also were a key consideration for the senior leaders in this study. Most leaders suggested placing more emphasis on the early planning stage in order to better understand the exact requirements of a program. Here again, emphasis was on setting up the program for success. Programs with well-defined, and therefore adequately resourced, requirements were recognized as more likely to deliver on time and within cost.

The most successful acquisition leaders are the people who know what "right looks like," but realize that they don't know everything. They are driven, but relatively humble.



The Right Approach: Tailor the Process to the Product

Taking the right approach to a program involves creating an appropriate acquisition strategy. The strategy must then be translated into a contract that makes sense to industry, incentivizes it to perform, and provides the government with mission-enhancing products at a good value. All the programs in this study tailored their process approaches to their specific acquisition needs.

Mutual understanding is extremely important. In times of resource scarcity and looming budget cuts, we must minimize wasted resources (cost and schedule overruns, canceled programs). One major factor that will help is truly understanding the perspective or "value proposition" of our business partners. While it may seem counterintuitive to take a contracting process that is already too long, and possibly make it longer, it takes an investment in time, up front, to get this right. This is especially hard to enforce when it seems we always "need the product *now*." One way to help satisfy this factor, without adding much additional time, is to invest in such mutual understanding *before* the knowledge is required.

Several industry and government PMs touted the benefits of the Training With Industry program. Short of this, the Defense Acquisition University could develop a course that explains details of what motivates industry, how industry perceives risk and payoff, and even how it uses charge numbers. [Editor's Note: In the spring of 2013, DAU will launch a new course, ACQ 315—Business Acumen, to be taught by DAU professors with industry experience.]

While our acquisition leaders do not need to be experts in this area—they have functional experts as advisers—better education will allow them to create mutually beneficial business arrangements. Furthermore, basic DAU contracting courses should be mandatory for our acquisition professionals, and not simply optional courses taken for certification.

Understanding our business partners demands that we talk. We must do the right thing, but we must not be so afraid of either protest or results of oversight that we shut down precisely at the point where we should communicate more. Multiple industry leaders felt that government behavior indicating fear of protest was increasing.

Change is constant, and we rarely get our programmatic strategies 100 percent correct right from the start. Fundamental to success is the ability to *adapt* the approach or acquisition strategy as major changes occur.

Conclusion

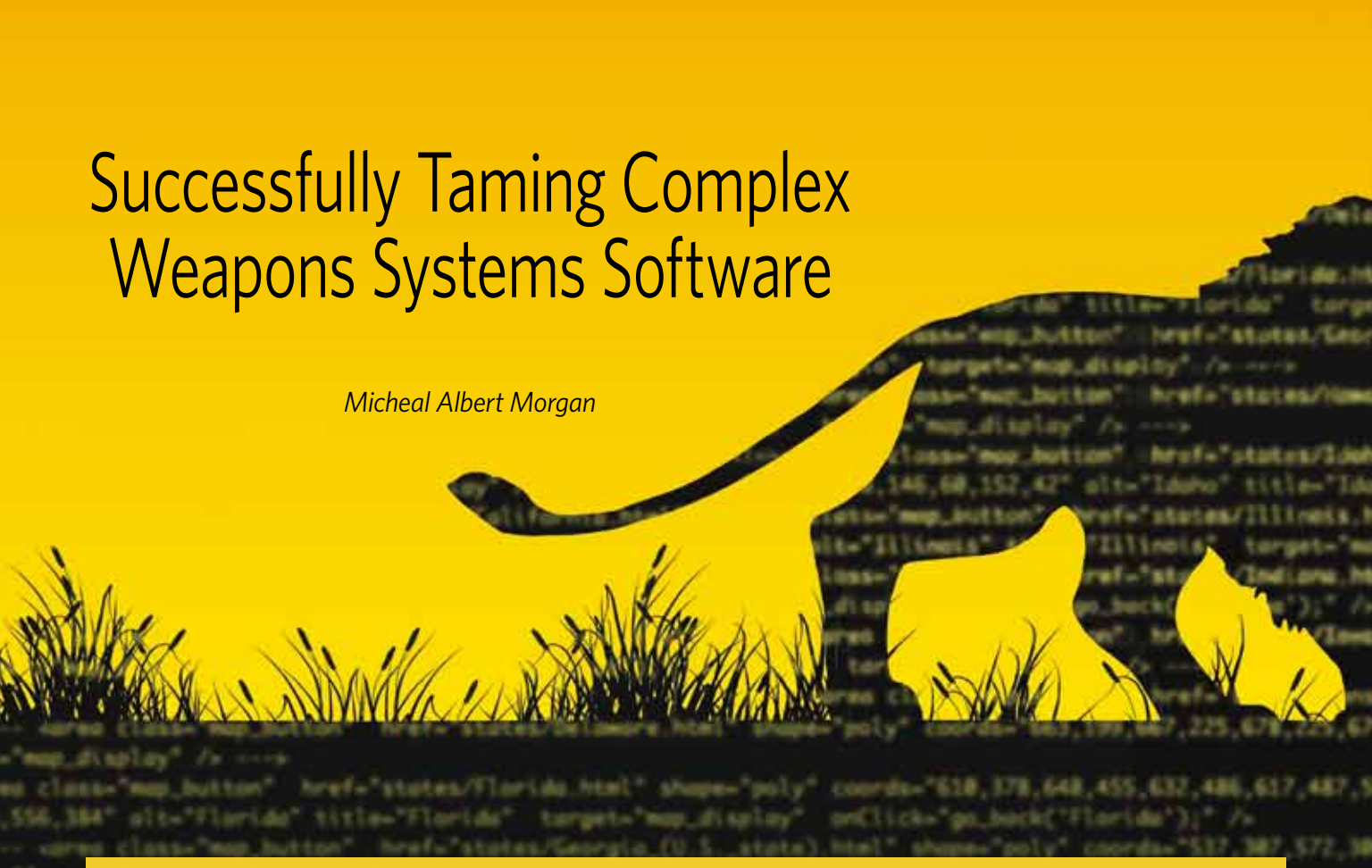
This research started with the premise there were characteristics that made some programs more successful than others, and that the most essential elements of success would be recognized across the entire development community. In fact, that appears to be the case. Essentially, we confirmed a well-established principle: Successful programs are built on a firm foundation. The creation of that foundation starts with realistic and stable requirements. It then grows in depth as the right people are selected to achieve those requirements and is strengthened by a sound strategy that focuses the team on the product rather than the process of acquisition. Along the way, strong leaders keep the team together, pulling in unison to achieve a well-defined goal. They communicate, clarify, direct, and inspire.

While this may sound idealistic, Army acquisition teams are making this happen every day. We don't talk about these efforts as often as we should, and we often get bogged down in our shortcomings—more focused on preventing mistakes than promoting success. We can, however, change this paradigm. The Army knows how to cultivate leaders who understand their tradecraft; leaders who study what works, but, more important, why it works. It is that understanding of the art of acquisition that arms our decision makers with the knowledge required to develop the right approach, the insights needed to select the right people, and the confidence necessary to push back when unrealistic demands are levied. We must continue to cultivate acquisition leaders who study their tradecraft—for, despite what is often heard inside the Beltway, when properly structured and effectively led, Army acquisition programs succeed.

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Successfully Taming Complex Weapons Systems Software

Micheal Albert Morgan



Software seems to be one factor that has driven space, aircraft, and other weapons systems to cost overruns and schedule slips—that nebulous "something" we know exists but cannot visualize or get a handle on. Yet it can be tamed, as wild beasts like lions and tigers are tamed by talented animal trainers. I had the privilege of running one medium-sized software system development that was unique in its success. The high fidelity systems simulator (HFSS) is the only project on a contract to endure three Nunn-McCurdy congressional investigations that finished within budget and on schedule.

A complex project requires several thousand small choices. We had the good fortune that the project management office and the contractor facility were within 5 miles of each other. I was always within reach by phone and e-mail and always present for each software coder's computer software configuration item (CSCI) presentations to management, to document CSCI progress. At each review, the coders could ask me questions on topics that would influence the direction of future coding. In turn, I would ask the contractor coders, the other knowledgeable people in the program office, and software testers what features they considered most important.

Communication is crucial to so many human activities, from parenting to leadership in battle. Listening to opinions different from your own and engaging in discussion helps keep the peace. Bridging gaps in perspective is a special skill and a key trait of a leader. However, a decision ultimately has to be made. If a new insight does not sway the disagreeing party, I simply remind the person that it is better to make a wrong decision early in the program, because its wrongness will soon be discovered, and much rework will be prevented.

Morgan *is the systems engineer for the Air Force GPS systems simulator program, previously serving as its project engineer and software maintenance programmer. He has also served in similar positions on other weapon system programs. He has an MS degree in computer science.*



The HFSS team was using the Software Engineering Institute (SEI) personal coding practice, coupled with a team set of practices that had reached Level 4 of capability maturity. Two of the coders had experience as satellite operators, which added an operations viewpoint to the team's system knowledge. The open dialogue among coders, managers, and me (acting as project engineer and project manager) was based on mutual understanding of the critical need for a high-fidelity simulator, for both training and testing. Although we were working amid the onerous atmosphere of the 50 percent cost overruns and 18-month schedule delays that all the other software teams were experiencing, there was camaraderie among the HFSS team members. In addition, the team was determined to show that meticulously following SEI practices could produce a solid product. It was extremely fortunate that the Lockheed Martin management team, the government project manager, and most of the coders recognized the value of SEI and Capability Maturity Model Integration practices.

The team members made a conscious decision to let process rule over preference. The HFSS was composed of more than 1 million source lines of code. One factor that helped HFSS keep on schedule and within budget was writing the test procedures during the coding process (design to test). Additionally, we prevented rework by ensuring we addressed all requirements in the specification. We included satellite software code within the HFSS so the simulated satellite would respond like the actual satellite. Hosting the satellite software turned out to be the most labor-intensive activity of the project; it consumed 40 percent of two of the coders' time. Thus using commercial off-the-shelf or other nondeveloped item code actually takes more schedule than coding the functionality does. We used statistical approaches such as coding response delays, as simple averages of measurements taken over a 2-week period. Using stand-in statistical values when a required or specified value was not supplied allowed coding to proceed while we continued research into actual values. Another example is that the ground-to-space signal delays were made variable based on time of year at each location. For more precisely defined values, such as the simulated hardware, pieces of simulated equipment were coded to behave as described in the technical orders or commercial manuals.

Modeling functionality of an already fielded system may seem far simpler than coding new functionality. It seems natural to assume the HFSS created less risk than the risks that come with the unknowns of a new



I was fortunate that my other responsibilities were suspended during HFSS development. Still, having two other knowledgeable government people on the project would have made life easier for most of us.

capability. The HFSS was a pioneering project in large-scale space-system simulation. From a technical difficulty viewpoint, I would estimate that the number of open questions was in the 70 percent to 90 percent range of what a similar-sized new capability system would produce. It is apparent to me, from the simultaneous roles I played, that larger software development projects require a government team to properly manage the project, rather than one person. That team should encompass former coders and former operators and be led by a manager dedicated to conformance with best practices. I was fortunate that my other responsibilities were suspended during HFSS development. Still, having two other knowledgeable government people on the project would have made life easier for most of us. This experience leads me to estimate that the acquiring agency needs at least one team member for every 100,000 source lines of code, depending on how the software is arranged.

We also were fortunate to have at our disposal the vast amount of experience and lessons presented in professional society publications. Our experience validated the concept that faithful conformance to best practices, as documented in professional society publications, removes many risk factors. The crippling of innovation and creativity that coders often raise is answered best by reminding them that they can use whatever features the coding language allows to code the process as long as they document how the Information Assurance Workshops standards are met. Of course, a stick and carrot for doing the homework needs to be tailored to each coder. Having the coders commenting and putting hints and other information in the software-development folder helps when the system is down and the commander is inquiring how long it will take to restore operations. But even for a fix to a routine software problem, it is helpful to have well-documented code.

HFSS won the 2001 Software Simulators Society first prize. Its true value is best demonstrated by the fact it has been updated and in use for more than a decade. Since Boeing replaced Lockheed Martin as prime contractor, the HFSS has been renamed the GPS system simulator (GSS). It has reduced software delivery bugs to less than one per release. It also has reduced operator-induced incidents to zero. This is noteworthy for a system that has become a worldwide utility that industries, military operations, and individuals rely on daily. It has allowed the GPS program office to move beyond the telemetry, tracking, and commanding (TT&C) mission with much more emphasis on warfighter support. No matter how sophisticated the GPS signals become, assurance of no hazardous misleading information is a trust we must strive to fulfill.

A key factor was inclusion of the project manager as a team member in the development effort. I credit the Lockheed Martin project manager for welcoming me into the HFSS team and granting me full access to call on coders and every other member of the project team just as if I were a Lockheed Martin employee. Having been a software maintenance coder, I could understand when coders explained their difficulties. As a systems engineer, I understood satellite functionality and TT&C functionality and how they related. Fortunately, the space-to-control interface was well documented in an interface control document. TT&C functionality was described in a set of hardware and software specifications and design development documents. Satellite functionality was adequately described in a set of orbital operations handbooks, as well as specifications.

HFSS is to date the only project delivered on a contract that actually was reduced in scope (the contract work transferred to the succeeding contract a piece at a time). Upon delivering the HFSS, the Lockheed Martin chief software manager noted: "Nothing helps a project to succeed as well as a well-informed customer." Indeed, knowing software and spacecraft terminology helped me contribute to meaningful conversations on project questions. In addition, the GPS system was quite well documented (I myself had reviewed and edited many of the specifications). That said, the crucial factor in our success was having an experienced and dedicated team of people committed to following SEI well-established performance practices. I must also credit Capt. Lee Corey for taking care of the details of both funding and contracting. He must have worked diligently behind the scenes to shield us from the often critical naysayers who can drag any project into delay. Unfortunately, smooth-flowing, successful projects seem to get little attention and are assumed to be normal by the uninformed. As a taxpayer, I could certainly stand much more "normal" in government acquisition of software. &

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Nine Steps to a Better Statement of Work



Joe Moschler ■ *Jim Weitzner*

Many people are familiar with Gary Larson's comic strip, "The Far Side." One of his well-known cartoons depicts a castle with a moat under construction *inside* the castle walls. The caption reads, "Suddenly, a heated exchange took place between the king and the moat contractor." Although humorous, this cartoon shows the predicament acquisition managers find themselves in when requirements are poorly communicated to the contractor.

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A recent GAO report (GAO-12-1290) cites a new dining facility constructed in Afghanistan that experienced delays and additional costs because the original construction did not include a kitchen. Why? A kitchen was not specified in the original SOW.



One of the primary communication vehicles for conveying requirements to all parties involved in the acquisition process is the statement of work (SOW). The SOW is a foundational element for a successful acquisition. It is a key tool to managing stakeholders and their expectations. That said, the SOW often is overlooked and not given the proper consideration, time, and effort required to make it effective.

Within the context of government contracting, the SOW is defined as the portion of a contract that establishes and defines all non-specification requirements for contractor efforts, either directly or with the use of specific cited documents. This definition sounds fairly straightforward; however, it cannot be overstated how critical the SOW is to contracting success. It provides a clear description of the work requirements enabling a common understanding between government and contractor project managers. As in "The Far Side" cartoon, a poorly written or incomplete work requirement will lead to problems throughout the acquisition process. The following example illustrates how a poorly crafted SOW impacts acquisition and, ultimately, the warfighter.

A recent Government Accountability Office report (GAO-12-1290) cites a new dining facility constructed in Afghanistan that experienced delays and additional costs because the original construction did not include a kitchen. Why? A kitchen was not specified in the original SOW. This is a rather obvious omission from the SOW, but it was not discovered until after the contract was executed.

There are no foolproof ways to ensure the SOW will be effective and without flaws. In fact, there is probably no such thing as a perfect SOW. However, treating SOW writing as a logical and structured process is generally a reliable way to start down the path of developing effective requirements.

Following nine steps can help craft a SOW that will be the basis for effective solicitations and ensure that the government's requirements will be clearly and fully articulated. In turn, this will allow offerors to develop proposals that better reflect the government's contracting objectives and ultimately result in contracts that are mutually beneficial to both parties.

Step 1: Define the purpose of the acquisition.
As with any problem-solving method, the first step is to clearly and accurately understand the purpose. The purpose of government procurement actions covers a broad range of objectives that vary based on many different factors such as: what is being bought (supplies or services), the complexity of the supply or service, the degree of development of the supplies or services, or whether the supply or service is commercial or government-unique. Often, the objective of the procurement is provided to the SOW Development Team by management and is based on such documents as the Acquisition Strategy, Acquisition Plan, and requirements documents.

The purpose of the procurement will determine the nature of the requirements document(s) used in the contracting process. The three primary documents used in DoD acquisitions are SOWs, statements of objectives (SOOs), and performance work statements (PWSs).

SOWs clearly identify the specific work efforts associated with the acquisition of supplies. They are used when the government has a clear understanding and preference for the type and level of work required for that acquisition. Because there is a preferred approach, SOWs are more prescriptive than either SOOs or PWSs. However the level of detail ranges from providing detailed instructions on how to perform the work to giving a broad description of the type of work to be done.

SOOs provide a broad description of the desired outcomes of an acquisition and are used in solicitations for supplies when the government either has no clear identification of, or no clear preferences for, the type and level of work associated with the acquisition. Each offeror will propose the specific types and level of work they propose to do in fulfilling a resultant contract. The winning contractor's proposed work effort usually becomes the contractual SOW.

PWSs provide performance-based desired outcomes with associated standards for services being acquired. PWSs are the preferred documents when buying services for DoD.

During the remainder of this article, the information and guidance provided specifically addresses the development of SOWs. Information on PWSs and Services acquisition can be

found at the DAU Acquisition Center of Excellence for Services (available online).

In addition to determining the type of requirement document(s) to be used, the purpose of the acquisition will affect the amount and method of conducting market research and types of requirements that will need to be imposed, thereby impacting the membership of the SOW development team.

The purpose of the acquisition needs to be clearly articulated into contractual language as this will become the scope of the SOW and the discriminator of whether proposed work is within the "scope" of the contract or not.

Step 2: Select the major areas to be included in the SOW.

The scope will drive the type and nature of the requirements to be included in the SOW. The SOW development team members should examine the requirements as a team and determine the level of interest each subject matter expert (SME) has for each requirements area. By tabulating these levels of interest into an areas of interest matrix (AIM), a determination can be made how best to organize requirements with interest from multiple SMEs. Using the simplified AIM shown in Table 1, it appears as though configuration management should be best addressed cohesively as a separate major area within the SOW rather than as a subparagraph within multiple SME areas. The areas included within the SOW could be either a functional area of expertise (e.g., program management) or a cross-functional specific area of interest (e.g., training).

Step 3: Identify program- and phase-specific risks for each area of interest.

After the major areas have been identified for the SOW by effective use of the AIM, the risks and opportunities associated with each major area should be identified. Rather than using generic risks, specific risks for the item being acquired and its associated Acquisition Life-Cycle Phase, if appropriate, should be identified. This enables the development of a SOW that focuses on risk areas that will allow the government to differentiate between proposals based on the contractor's ability to best manage the risks and opportunities associated with the specific acquisition. Additionally, during contract execution, the contractor's efforts will be focused on addressing risk and opportunity areas.

Step 4: Develop a phase-specific work breakdown structure for each area of interest.

After the risks and opportunities have been determined for each major area to be included in the SOW, a work breakdown structure (WBS) in accordance with Military Standard 881C, *Work Break Structures for Defense Materiel Systems*, should be developed for each area. The WBS should identify all tasks and activities that need to be addressed within that major area for successful acquisition execution during the period of performance of the contract.

Step 5: Determine government and contractor responsibilities for each WBS element.

After the tasks have been identified by major area, the SOW development team should analyze the tasks against other acquisition documentation (e.g., acquisition strategy) to determine which party (government or contractor) is responsible for the completion of that task. This responsibility can be categorized as follows: "contractor only," "contractor with government support," "government with contractor support," and "government only." Because the SOW identifies work efforts required of the contractor for successful contract execution, tasks identified as being "government only" should not be included in the SOW. Any tasks requiring contractor expenditure of effort must be included in the SOW along with any actions planned by the government in support of those tasks (e.g., delivery of government furnished material [GFM]).

NOTE: Steps 3 through 5 may be done sequentially or iteratively.

Step 6: Develop a SOW outline.

Just as when writing a research paper, the first step in writing a SOW is developing an outline. Following from Step 5, the outline should logically organize the work efforts to permit the clear identification of the government's expectations for the contractor's tasks, contractor support for government tasks,

Table 1. Sample Areas of Interest Matrix

	Program Management	Systems Engineering	Logistics	Contracting	Test and Evaluation	Etc.
Configuration Management	X	X	X		X	
Technical Reviews	X	X	X	X	X	
Earned Value Management	X	X	X	X	X	
System Safety	X	X			X	
Systems Engineering Management Plan (SEMP)		X				
Training	X	X	X		X	

"The contractor shall conduct a critical design review" is active, and it is clear who is doing the action. In "A critical design review will be conducted," you do not know who is conducting the critical design review.



and support the contractor can expect from the government in support of contractor tasks.

In developing the outline, a standard format should be used such as the *DoD Handbook for Preparation of Statement of Work* (Military Handbook 245D). This handbook provides guidance on how to prepare a SOW for any phase of the materiel acquisition life cycle. Specifically, it covers the preparation of SOWs which correlate to the acquisition life cycle phases identified in the DoD Instruction 5000.02, discusses the operation of the defense acquisition system. As discussed in Step 4, the use of the WBS is essential in the development of the SOW outline. It will facilitate a logical arrangement of SOW elements and provides a checklist to ensure all necessary elements are addressed.

Step 7: Develop the SOW content.

Based on the created outline, each contractor task must be fully described. Each of these tasks should be delineated and as specific as possible. This allows the contractor to clearly understand the requirements and better estimate their costs. This in turn prepares both the government and the contractor for the project, and will reduce conflict resulting from assumptions and undocumented expectations. This will minimize the need for change orders and associated unforeseen cost to the project. A well-written SOW is the reference point to be used to resolve disagreements that may arise on the contractual deliverables, roles, and responsibilities.

The most important aspect of the SOW is that it clearly communicates to the contractor what needs to be done. As simple as this may sound, it is difficult to do. It takes time and effort to carefully craft SOW statements to ensure they are understandable, discrete, and precise. There are many guidelines, dos and don'ts, and lessons learned available to assist in writing a SOW. Although an extensive discussion on these types of resources is not possible in this article, a few key points will be made. The requirements for the contractor must be expressed explicitly using language that is understandable by everyone. The SOW language style is critical; the use of active voice is recommended. Generally, active voice is easier to understand and more to the point. Passive voice is often vague and awkward. More importantly, when writing in passive voice, you can leave out the person or entity doing the action. For instance "The contractor shall conduct a critical design review" is active and it is clear who is doing the action. In "A critical design review will be conducted," you do not know who is conducting the critical design review.

When writing tasks, use words that have one meaning to prevent multiple interpretations. This assists the contractor in accurately pricing the task and prevents confusion on what the task really entails. The tasks defined in the SOW must be clearly defined and verifiable. For example a task written as "The contractor will hold technical interchange meetings as required." is ambiguous, subject to interpretation, and impossible to price accurately. Similarly, nonspecific terminology "as necessary" or "in accordance with best commercial practices" is difficult to enforce and price.

Another area worthy of discussion when writing SOWs is the use of performance language vs. "how to" language. Including too many "how to" requirements may constrain the contractor's efforts and become cost drivers. When possible, state the desired outcome and give the contractor the latitude to determine how to complete the task.

Step 8: Conduct an internal review.

Writing the SOW to be understandable to others and clearly defining the requirements is a challenge. To help achieve this goal, the SOW writing team should conduct a rigorous internal review of all the documentation. Aside from helping to ensure the SOW is a quality product, it will prepare the team for the next step, the external review or "Murder Board." Each team member involved in the SOW writing should review the SOW to check for omissions, redundancies, consistency, and clarity within the document. Each team member should read the SOW from the contractor's perspective and ask, "Do I understand each task such that I can make a reasonable price estimate, and can it be verified to the government's satisfaction?"

Step 9: Conduct an external review.

The final step in the SOW writing process is going through an external review, sometimes more aptly referred to as a "Murder Board." Generally during this step, senior functional

SMEs will review the SOW. This may include the contracting officer, legal counsel, PM, and other technical experts familiar with the SOW content. The intent of this review is to provide the final sanity check for the SOW to ensure the contractor will receive a complete, understandable document that effectively communicates the requirements. These reviewers typically have a great deal of experience in reviewing SOWs and know common potential trouble spots and pitfalls SOW writers may face.

In summary: The development of a meaningful, enforceable SOW should be viewed as an investment, not as an expense. The time and effort spent in developing the SOW (and other solicitation and contractual documents) will pay dividends in increased confidence in the ability to select the best proposal and hopefully less contention and better contract execution.

Successful program or contract execution can never be guaranteed. However, effective planning lays a solid foundation that increases the possibility for success. The steps described in this article provide a pathway for the foundation by identifying a process that encourages and facilitates critical thinking during the development of the SOW.

Many of us are familiar with the child's nursery rhyme "For Want of a Nail":

For want of a nail, the shoe was lost.
For want of a shoe, the horse was lost.
For want of a horse, the rider was lost.
For want of a rider, the battle was lost.
For want of a battle, the kingdom was lost.
And all for the want of a horseshoe nail.

Within DoD acquisitions, this might be rewritten as:

Because of a bad SOW, a bad solicitation was issued.
Because of a bad solicitation, bad proposals were received.
Because of a bad proposal, a bad source selection was made.
Because of a bad source selection, a bad contract was issued.
Because of a bad contract, cost and schedules were missed.
All because of a bad SOW.

In DoD acquisitions, the missing nail that initiates that calamitous chain of events is often the lack of well-developed requirements documents.

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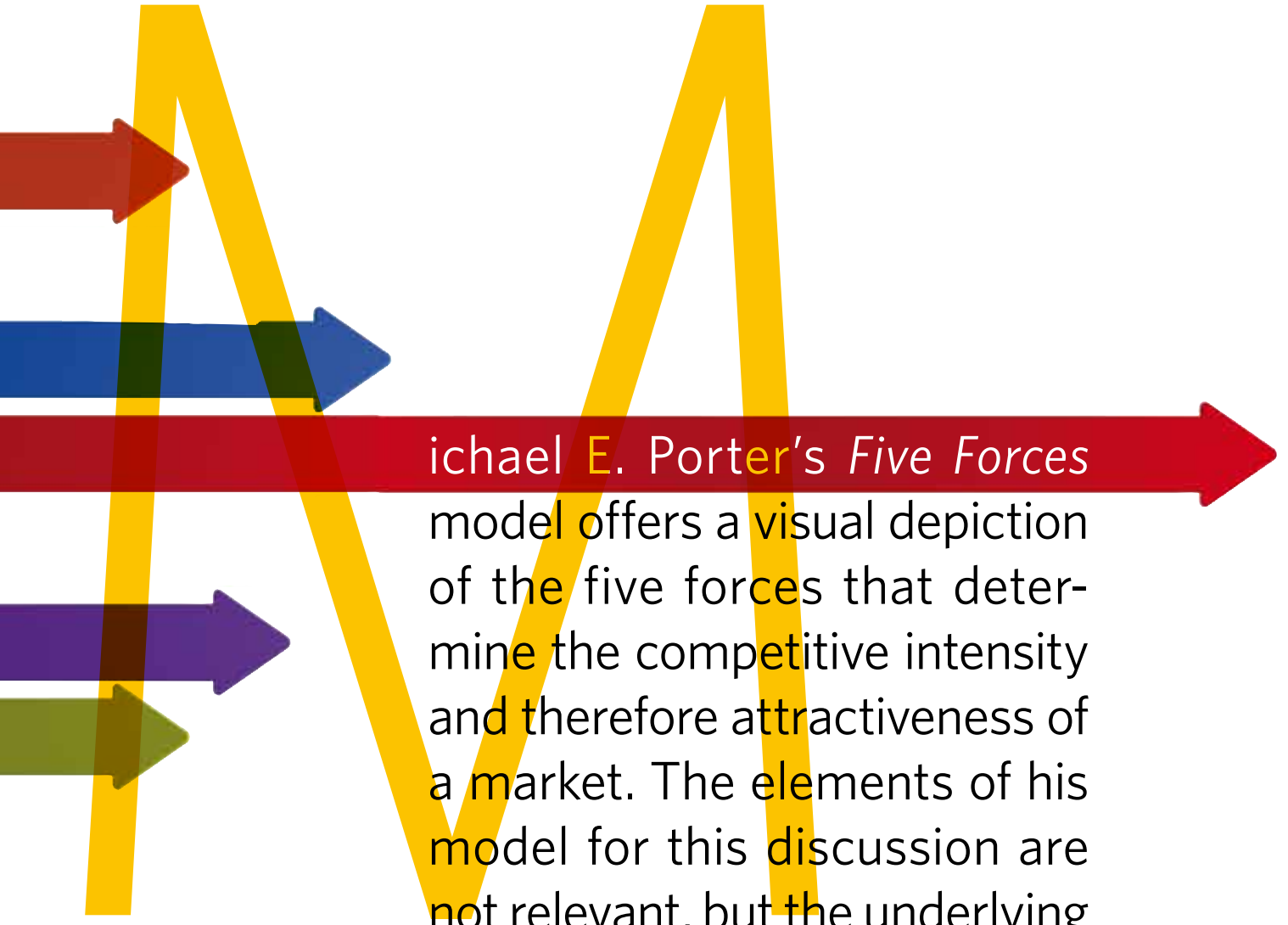


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A New Set of Forces

David E. Frick, Ph.D.



Michael E. Porter's *Five Forces* model offers a visual depiction of the five forces that determine the competitive intensity and therefore attractiveness of a market. The elements of his model for this discussion are not relevant, but the underlying principle of the model is—forces can be self-correcting. Any imbalance in one element tends to motivate businesses to take some action to take advantage of the imbalance—e.g., entering

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or leaving the market or raising or lowering prices. The result is that eventually, the industry will approach a state of equilibrium (pure competition) where profits are minimal. A more simplistic example of self-correcting forces is the venerable law of supply and demand. Changes in the aggregate supply or demand of a product tend to affect the price demanded or the amount of the product offered for sale. The ultimate example of self-correcting forces is the free market itself.

Unfortunately, macroeconomic principles do not always prove useful at the microeconomic level. Performance-based acquisition appears to be one of those principles that looks good on paper and has proved quite successful in private industry but has had little success in government. Why? The answer is simple. The inherent self-correcting force that makes performance-based efforts successful in industry (the profit motive) has no influence in government.

Grab any article on any topic in the acquisition profession, and it is likely that the author advocates a greater emphasis on performance-based acquisition. The advocating position is an easy one to take. From a theoretical perspective, it is as hard to argue against performance basing as to argue against clean air. It sounds so good, in theory. In reality, the potential benefits of performance basing—i.e., the potential for achieving better outcomes—do not appear to be of sufficient "personal" value to government decision makers to justify the additional upfront costs and effort of creating a well-designed, performance-based acquisition. As the principal-agent problem suggests, people will act within the limits of their discretion to advance personal interests, even when these acts tend to minimize organizational interests. The potential benefits to the organization are simply not sufficiently compelling to serve as a self-correcting force. Decision makers err on the side of caution and revert to time-tested, comfortable habits in planning and contracting.

Since the 1990s, the federal government has been moving toward a results-oriented, performance-based environment. Under performance-based contracting, agencies describe the outcomes desired, not how to achieve those outcomes. Performance basing is prefaced upon an ability to clearly define objectives, unambiguously measure progress, honestly evaluate performance in reaching those objectives, and structuring an environment that aligns the government's objectives with industry objectives—i.e., profit. Throw in a few cups of good communication, and you have a recipe for success.

Despite the great body of anecdotal evidence that performance basing can be a force for good, the federal government has never achieved the Office of Federal Procurement Policy (OFPP) goal of 50 percent of all federal acquisitions structured as performance-based. Anecdotally, agencies have realized measurable cost avoidance by applying performance basing in appropriate situations. Some claims are as high as 12 percent, yet there still exists a prevailing lack of confidence in the efficacy of performance basing, particularly when we

The use of the term "best practice" needs to be purged from the federal lexicon. On its face, the term presumes that this practice is best and no other will do. This leads to a propensity to try to force a square peg into a round hole. One-size-fits-all solutions seldom fit everything. From a pure use-of-language perspective, the terms "promising practices" or "proven practices" might serve us better.

deviate from the standard candidates such as janitorial and lawn maintenance services. Upfront costs are perceived to be larger than they truly are and serve as a substantial barrier.

An unemotional, rhetoric-free analysis of the topic strongly suggests that performance basing is not a good candidate for adoption by the federal government as a "best practice."

- The goals of industry and government are different.
- In industry, coming in under budget leads to better bottom lines and rewards. In government, not spending your entire program budget leads to smaller future budgets and the perception of punishment.
- Government agencies are constrained by the Federal Acquisition Regulation (FAR), industry is not. Industry can enter into strategic alliances that are prohibited to agencies because of competition and conflict-of-interest rules.
- Performance-based acquisitions and the performance-based contracts that support them demand a level of government oversight that is greater than that of other constructs. In times of diminishing budgets and workforce, committing agency resources to a methodology that does not have an unambiguously successful track record is difficult for decision makers.

The goals of government and business always will differ, although at times they may be compatible. Adjusting the goals of government clearly is not an option. Therefore, senior government leaders must acknowledge this inherent difference and eschew mandating upon the agencies common business practices without clear evidence of their appropriateness for government. From this perspective, the OFPP goal of 50

percent is laudable, reasonable, and something we should all strive to achieve, although it appears unlikely to be obtainable.

Personally, I am a staunch advocate of performance basing. My experiences have been very positive, and I have yet to find a valid government need that could not be expressed in terms of measurable outcomes. Nonetheless, bringing my immediate colleagues into the fold has often been reduced to an argument of "Try it; you'll like it." In this aspect, performance basing is similar to broccoli; you really like it or think you hate it.

To add insult to injury, savings realized in performance-based acquisitions can be recovered to satisfy other needs, but the facilitator and the benefactor are seldom the same. In a typical scenario, Manager A constructs a highly effective performance-based acquisition that results in savings. The agency head then applies these savings to the needs of Manager B. Then, having once demonstrated an ability to realize cost savings, the expenditures in the year of execution become the baseline for the out years. All these decisions are proper from the perspective of the agency. Nonetheless, the motivation for Manager A to act in like fashion in the future is diminished. The forces that normally drive performance basing (cost savings and better use of agency funds) act against the practitioner.

The FAR in itself is not a barrier to performance basing; however, the competition rules do prevent government agencies from taking that next step toward establishing strategic alliances. A true strategic alliance, in the business sense, between the government and a for-profit organization, is replete with opportunities of running afoul of procurement integrity statutes and crossing the line of inherently governmental activities. The FAR and government policy encourage partnerships between business and government, but only within a very narrow path.

Successful performance basing demands increased vigilance and surveillance by the government. This tends to be labor-intensive and demands a specific acquisition profession-related skill set for the non-acquisition personnel who typically perform that oversight. As budgets get tighter and workforces get smaller, functional leaders are under pressure to concentrate on core missions. This makes performance basing even less attractive from the perspective of the functional leader.

So if performance basing is not appropriate for government, is there another practice it should adopt that has the potential for similar outcomes, i.e., reduced costs, increased performance, or both? The answer to this question is, "Not likely." If other practices existed, they would be evident within a free market replete with organizations seeking competitive advantage.

Are there other actions Congress or the senior defense leadership can take that will make adopting performance basing a more attractive (or at least a more palatable) option to acquisition practitioners? The answer to this question also is, "Not likely." A top-down, compliance-driven approach is very seldom successful. As John Kotter, Egar Schein, Peter Drucker, and others have suggested on many occasions, organizational culture can be a daunting barrier to change. Holding leaders accountable for the decisions of subordinates is reasonable, but the influence of senior leaders is greatly diluted when it must permeate multiple layers of management. The influence of the revolutionary leader's vision is even less influential when risk-averse juniors make decisions that are legal, within their discretion, and defensible. The challenge for the senior is to demonstrate to the junior decision maker that the new way of doing business is consistent with the junior's enlightened self-interest. A bottom-up, change-of-culture approach might prove successful over time, but it has not worked so far.

Performance basing also tends to favor large businesses, which is inconsistent with the government's desire to give preference to small business, where practical. There is great comfort in the government telling you what to do and how to do it when hundreds of years of tradition and case law tell you that if you follow these instructions exactly, you will get paid regardless of outcomes. If the small business assumes the mantle of risk-taker and innovator, the likelihood of getting paid is less assured. Small businesses with limited capacity to absorb losses will eschew competing for performance-based work (which pays for the greater potential for innovation with an increase in uncertainty) for more traditional constructs.

Contract type is also a factor in the large vs. small competition. Performance-based, firm fixed-priced contacts, contingent on outcomes in the distant future (distant for small businesses fighting to survive into the next quarter) tend to favor large businesses with greater capacity for assuming uncertainty, the cost of money, and financial risk.

Multiple instances of poor execution of performance-based acquisitions over the years are the final nail in the reputation of performance basing. Since bad examples tend to be emphasized and good examples ignored in the media, the bad becomes dominant in the minds of the public and performance basing becomes something to avoid in the minds of the government manager—in the same vein as conferences are quickly becoming taboo because of the bad acts of a few.

In summary, we have a concept that is very difficult to put into practice and that, when attempted, has a high failure rate in an environment intolerant of failure. Is performance basing, therefore, doomed for the scrapheap of well-intentioned ideas? Hopefully not, but the evidence is mounting. After decades of practice, it has yet to enter the mainstream of the acquisition profession.

Is there an alternative to performance basing that is influenced by natural self-correcting forces that would be viable for the federal government? The answer is not in this article. Consider this a plea to bring forth your ideas for discussion. &

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Rethinking "Acquisition Experience" for Program Manager Certification

Jan Kinner

You have been tasked to assign someone as the program manager (PM) of a weapon system major defense acquisition program (MDAP) that is transitioning from the Technology Development (TD) Phase to the Engineering and Manufacturing Development (EMD) Phase. All the candidates meet all the statutory and regulatory requirements to be assigned as a PM of an MDAP. Each has an impeccable record and is recognized as an accomplished acquisition professional. Each has one or more graduate degrees, has graduated from the Defense Acquisition University's Program Manager's Course, is a member of the Acquisition Corps, and has held an acquisition Key Leadership Position (KLP). They only differ in the amount of acquisition experience they have. Based on this information, which candidate would you choose for this important job?

Kinner *spent 21 years in the Air Force acquisition community in various positions, including system program director of the Electronic Systems Center's Logistics Information Systems Program Office. He has held senior positions at several defense contractors. He is a Program Manager's Course graduate and is Level III certified in Program Management and Information Technology.*



- Ed—a PM with 15 years of acquisition experience
- Lisa—a PM with 16 years of acquisition experience
- Eric—a PM with 17 years of acquisition experience
- Ken—a PM with 18 years of acquisition experience

I would pick (and I assume you would, too) Ken, because he has the most acquisition experience. But any of the PMs could have been selected, because the statutory (Section 1735, United States Code 10) and regulatory guidance does not specify what type of acquisition experience one needs; it only specifies 8 years of acquisition experience, at least 2 of which were performed in a program office or similar organization, to be assigned as an MDAP PM, while assignment as a deputy program manager (DPM) of an MDAP requires 6 and 2 years, respectively.

In reality, it is hard to find PMs with experience in each phase of the acquisition life cycle. Instead, PMs usually have 3 or 4 years of acquisition phase experience repeated several times and often not even in the same type of system being acquired (e.g., weapon, information technology, etc.). In this case, Ken's first 8 years of experience were on weapon system programs in the TD Phase, and his last 10 have been with weapon system programs in the Operations and Support (O&S) Phase; he has no weapon system EMD Phase experience.

Reviewing the other candidates' records, you discover Ed's first 12 years were working on weapon system programs in the O&S Phase and for the last 3 years, he has been working on the Program Executive Officer's staff; he has no EMD Phase experience. Lisa's first 3 years were on a weapon system program in the Production and Development (P&D) Phase, the next 3 years on the PEO's staff, followed by 4 years on an Aquisition Category (ACAT) III weapon system program in the P&D Phase, and the past 6 years on a MDAP weapon system program in the EMD Phase—the last 2 years as the DPM. Eric worked his first 4 years on two ACAT III weapon system programs in the P&D Phase, followed by 6 years on information technology programs in various phases, then 3 years on the headquarters staff, and has worked the last 4 years on the Component Acquisition Executive's staff; he has no weapon system EMD Phase experience. Based on these revelations, would you stick with Ken or go with Ed, Lisa, or Eric?

My pick: Lisa. She has the most experience with weapon system acquisition programs in the EMD Phase and, as such has, been through the EMD school of hard knocks. She has a stack of lessons learned in her toolkit about what works and what doesn't. Lisa, in my opinion, is the best qualified PM for this tough job.



As a professor of the DAU's Program Manager's Course, I have talked to a lot of Kens, Eds, and Erics. They are fantastic PMs; they're smart, competent, and have proven themselves as leaders and managers. But they are nervous and even stressed about being assigned to a weapon system program in a phase or a different type program (e.g., IT) in which they have little or no acquisition experience. Some of their leadership and management experiences will help, but these are no substitutes for program-specific and phase-specific experience.

What is experience? Lots of definitions and even more examples are available from a wide variety of sources. Mark Lumb, in his Naval Postgraduate School thesis, "*An Examination of the Skills, Experience, Training and Education Requirements Needed as a Functional Area 97 Officer in the Army Acquisition Corps*," wrote:

> Experience is the frame of reference gained from actually working in the procurement environment. It consists of all of the endless impressions and intangibles derived from being immersed in the actual environment—as opposed to having it described in the artificial environment of a classroom. Education and training are invaluable, but without a frame of reference to translate them into coherent actions, their effectiveness and value are reduced considerably.

While PMs can relate to the larger Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System, their experiences are often limited to a phase or two. So when they are assigned to a phase or different type of program in which they have no experience, they have general knowledge on what needs to be done, but lack the "endless impressions and intangibles derived from being immersed in the actual environment."

In its 2010 report, "Strong Leadership Is Key to Planning and Executing Stable Weapon Programs," the Government Accountability Office found 16 of the 63 MDAPs reviewed appeared to be stable and on track to meet original cost and schedule projections. Common attributes of the stable programs included strong senior leadership support, disciplined PMs, and solid business plans that were well-executed. The PMs "tended to share key attributes such as experience, leadership continuity, and communication skills that facilitated open and honest decision making." The GAO went on: "Officials from our case study programs indicated that prior experience gives a program manager the knowledge to recognize and mitigate risks, and effectively respond to unanticipated problems that arise."

The phrases "stable and on-track" and "disciplined PMs" aren't found in the GAO's March 2012 annual assessment of selected DoD weapon system acquisitions. The GAO found the total acquisition cost of the 96 programs reviewed has grown by over $74.4 billion in 1 year. The growth, according to the GAO, can be attributed to factors such as inefficiencies in production, quantity changes, and research and development cost growth. There was no mention of PMs as contributing to cost or schedule growth or the lack of program-specific or phase-specific experience as one of the reasons for the cost and schedule growth—even though they are the ones in charge of the program! The only recommendation the GAO made pertaining to PMs is that there should be an alignment of PM tenure to complete the development phase of a program—something the DoD is striving to achieve through the use of tenure and PM agreements.

It certainly would be an interesting research project to see if there is a positive correlation between a program's cost growth and the program type and/or the phase-specific experience level of the PM.



Many, but not all, of the factors that contribute to cost growth or schedule slips are outside the control of the PM—no matter how much experience he or she has. But how much is attributable to a PM assigned to a system with which he has no experience and a phase in which he has no experience? We probably will never know, but it certainly would be an interesting research project to see if there is a positive correlation between a program's cost growth and the program type and/or the phase-specific experience level of the PM.

While changes, in response to statutory requirements, evolving and new technologies, mission requirements, and Service's needs, continue to be made to the training requirements for PMs (e.g., the addition BCF 103, *Fundamentals of Business Financial Management* to the PM Level III core requirements) there have been no changes made to the experience standards required to be certified as a PM Level III or assigned as an ACAT I/IA, II PM or DPM, since such standards were mandated in statute and policy.

Today the Kens, Eds, and Erics receive "acquisition experience" credit if the position they occupied or are occupying includes

acquisition duties and responsibilities defined in the Acquisition, Technology, and Logistics (AT&L) Workforce Position Category Description (PCD). The PCD defines *general acquisition related duties* as "the conceptualization, initiation, design, development, test, contracting, production, deployment, logistical support, modification, and disposal of weapons and other systems, supplies, or services (including construction) to satisfy DoD needs, intended for use in, or in support of, military missions." It also defines AT&L career field/path *specific duties*: "Manage a defense acquisition program. Responsibilities may be broad (e.g., PM, DPM, or PEO) or focused (e.g., Assistant PM for a particular function), and may be line or staff in nature. Execute duties guided by DoDD 5000.01, DoDI 5000.02, DoD Issuances governing acquisition programs in the DoD Components, and other program management policies addressed in DoD 5000 and 8000 series. Not covered in this category are basic research programs." Based on this, a person can meet the statutory requirements for acquisition experience and be assigned as an MDAP PM of any type of program and a program in any phase of the acquisition life cycle, even though they have never worked on that type of program or the program is entering a phase in which they have little or no phase-specific experience.

The authors of the 2009 *OSD Study of Program Manager Training and Experience* recommended that "OSD and the Services develop program manager career track designations or specialty codes based on the acquisition framework itself: the type of program assigned, e.g., weapon systems, services, information technology, etc." They suggested a PM assigned to a weapon system program in the TD Phase receive, in addition to general basic acquisition skills, phase-specific training and be awarded an occupational code indicating weapon systems/technology development that would make the PM qualified to work on other TD Phase weapon system programs.

By following this recommendation, offered 3 years ago, the Kens, Eds, Erics, Marys, and Lindas, assuming they possess the requisite leadership and management skills, will have the needed knowledge, skills, abilities, and experience to increase their chances and the program's chances of success when assigned to a major program.

According to the April 2010 *Defense Acquisition Workforce Improvement Strategy* (Appendix 5), "Management of all aspects of DoD acquisition receives the highest level of congressional and DoD senior leader attention. Acquisition outcomes represent a major national investment and are critical to supporting national military strategy. DoD acquisition program managers carry a heavy burden of responsibility and a high degree of accountability for reaching successful acquisition outcomes." Isn't it time we started to certify PM by type of program and phase experience? Doing so will be one step in the right direction for improving acquisition outcomes.

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SECTION 3685, TITLE 39, U.S.C. SHOWING OWNERSHIP, MANAGEMENT, AND CIRCULATION

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Developing Air Force Systems Engineers—a Flight Path

Capt. J. Morgan Nicholson, USAFR

Throughout my career, I have observed a dilemma that faces program managers (PMs). How does a PM develop junior-level engineers into effective systems engineers? My first assignment in the Air Force as a second lieutenant was as a systems engineer responsible for depot maintenance of a $500 million, one-of-a-kind weapon system. I was part of an integrated product team (IPT) that managed the work of a defense contractor. We provided technical oversight, long-term sustainment strategy, and contractual support. For more than a year, I was the only government engineer on the program and thus the sole person responsible for technical oversight of 10 to 20 projects at a time. I reviewed and approved drawings, attended design reviews as the lead engineer, supervised installations, and

Nicholson *is senior systems engineer for a defense contractor and a member of the Colorado Air National Guard. He spent 7 years in the Air Force as a systems engineer.*

performed developmental test and evaluation (DT&E). Clearly, I was a junior engineer in a senior engineer's position. I was provided no systems engineering training or applicable system-specific training by my unit. Now, after 6 years as a systems engineer and PM, I have learned this is not uncommon.

Although developing systems engineers from the entry-level stage of their careers has many advantages, the way it was implemented in my unit carries a number of risks. Primarily, the junior-level engineers likely have no training in systems engineering (which is not often taught in a traditional engineer discipline's college curriculum). The junior engineers probably have no significant training or experience involving the particular system they are assigned to manage. For example, I was assigned to a phased-array radar—a highly specialized field—and received no system-specific training before being unleashed on the contractor as the primary technical representative for the program. Junior-level engineers put in this position face a difficult situation. They have no experience to draw on in making technical decisions, no training in systems engineering to help them fully understand the job requirements, and little to no understanding of the particular system in which they are asked to provide technical oversight.

Although the Air Force assigns entry-level systems engineers to program offices, this is not a traditional career path for systems engineers. In many industries, engineers are promoted to a systems engineering position from a more specialized role, such as project engineer or design engineer. Typically, the engineer might have significant experience working on various subsystems. This approach has a number of merits—most notably, that it avoids putting a junior engineer in a senior engineer role. However, it also has disadvantages. The project engineer who is promoted into a systems engineer role probably also lacks any systems engineering expertise. In addition, systems engineering is a technical leadership discipline, rather than a technical discipline. The assumption that the best project engineer in an organization will make the best systems engineer is known as the "halo effect" and is to be avoided.

Finally, there is a contrast between the perspective of a systems engineer and a design or project engineer. Design engineers usually are specialists, and systems engineers are generalists. The two disciplines are accustomed to viewing problems from different perspectives. Specialists generally see the world through the lens of their own specialty. To paraphrase Abraham Maslow: If all you have is a hammer, everything looks like a nail. Systems engineers are supposed to take a different approach to problem solving called "systems thinking," the "systems approach," or the "systems perspective." A systems engineer must be able to zoom out and view the problem as a whole. This typically does not require specialized skills in any particular specialty but a solid foundation on the entire system, its mission requirements, and how the subsystems interface with each other. Systems thinking is a difficult skill and can take many years to master.

Other armed Services take an approach different from that of the Air Force regarding military personnel working in a program office. Military members are required to complete an operational assignment prior to being assigned to a program office. The advantage to this approach is that the engineer has some user experience to draw on and some credibility with the user he supports. However, the disadvantages are similar: The systems engineer has little engineering experience and little specialized systems engineering training.

The Air Force approach to developing systems engineers is not typical, but it has many advantages if done properly. First, systems engineers can be trained early in their careers in systems engineering practices and techniques. They can receive specialized training for the system they are assigned to, if necessary. They can develop their systems-thinking skills throughout their careers. By the time they are senior-level systems engineers, their systems engineering skills likely will be highly developed, compared with those of their specialist counterparts. Furthermore, their technical leadership skills will be well-developed, putting them in a good position to succeed. As junior-level employees, the skill assessment used to evaluate them for promotion will more closely align to the skills necessary for their new jobs. A successful junior systems engineer may be more proficient in the skills needed to become a successful senior systems engineer than an equally successful project engineer. This helps to minimize the halo effect.

If the development plan is carefully crafted, the Air Force methodology can be highly effective in producing first-rate systems engineers. The single most effective technique to developing highly skilled systems engineers is to have senior systems engineers capable of mentoring the junior staff and willing to do so. Mentors can provide invaluable guidance, wisdom, and technical know-how to the junior engineer. A mentor can provide guidance on organizational processes and professional best practices and may have specific knowledge of the system being worked on.

The organization I worked in as a junior systems engineer (in a senior systems engineer role) had very little to offer in the way of mentoring. There was a "mentor program" that was given lip service, but the junior engineers received very little in the way of mentorship. Part of the problem was the lack of senior technical staff, which meant the pool of potential mentors was small to begin with and staff members often too busy with their own work to help the junior staff. However, this was because mentoring, despite getting much lip service in meetings, was not really considered part of the senior engineers' job—and was therefore a lower priority.

To remedy this situation, senior staff members must understand that mentoring the junior staff is a high priority. It should be expected that they spend some time and energy

helping develop junior systems engineers into seasoned journeymen in their trade. This must be instilled in the organizational culture and considered a necessary and important part of the job description of a member of the senior systems engineering staff.

Entry-level engineers in the Air Force are provided a minimal amount of training to support their development as systems engineers. They take the DAU coursework (SYS 101, ACQ 101, etc.), which is a helpful introduction to the defense acquisition framework and the field of systems engineering. However, every organization implements this framework and these systems engineering tools differently. Furthermore, many (perhaps most) program offices are involved only in a smaller portion of the framework and use only a subset of the methods described in these courses. One organization may perform research and development and spend all its time pre-Milestone A. Others might be supporting operations, and spend much of their time in a totally different acquisition environment. More specific training in the actual tools and techniques used in each of these organizations is a big benefit.

Having the senior systems engineering staff provide training to the rest of the systems engineering group on a weekly or monthly basis may be effective. I have seen organizations hold monthly brown-bag lunches, in which a senior engineer gives a presentation on a relevant topic. One session would discuss "software engineering best practices." The next would cover "requirements engineering." After the presentation, everyone would share ideas. The junior systems engineers asked questions and sought advice on related or unrelated topics.

Another important aspect of training is providing opportunities for junior systems engineers to learn about the actual system they work on. These training opportunities can be in the form of brown-bag lunches, a formalized training program, or continuing education courses. Many PMs do not have a good understanding of what is taught in engineering school. Therefore, it is difficult for them to determine what an entry-level engineer already knows and in what areas he or she may require training.

I work as a systems engineer at a ballistic missile test range. After arriving, I went through a series of 14 orientation lectures conducted by the senior staff, to provide me with domain-specific training on radar theory, orbital mechanics, ballistic missile trajectories, as well as job-specific functions (e.g., how to use a particular software program).

A key enabler to implementing this type of mentoring and training is the organizational structure. In my experience, having worked in all three basic organizational structures (projectized, matrix, and functional), projectized organizational structures are the most difficult environments in which to develop systems engineers. This is because mentoring and training are, literally, not part of the senior systems engineering staff's job description—unless, of course, a large number of systems engineers are on staff under a single project. Matrix and functional organizations give the entire systems engineering staff a connection to each other in the organization, which facilitates knowledge sharing and mentoring. Of course, there are other advantages and disadvantages to each organizational type that won't be discussed here.

Entry-level systems engineers, having no experience, lack credibility. Therefore, putting them in senior-level positions should be avoided. That is not to say they shouldn't be empowered and/or given responsibility—just that they should not be put into a position to "crash and burn." When I started out, I was told by my PM, "We are going to throw you in the water and see if you can swim." Although this was a great opportunity for me, it can lead to disaster for both the organization and the junior systems engineer's professional career. Junior-level employees, generally, are not sufficiently developed professionally to be given this level of responsibility. It is imperative that organizations carve out low-risk positions and tasks that can be accomplished by junior engineers so they learn the ins and outs of the organization, acquire the knowledge and skills required to perform more difficult tasks, gain confidence, develop leadership skills, and earn credibility with their coworkers and colleagues.

Hiring entry-level systems engineers in defense acquisitions and developing them into senior systems engineers has a number of advantages. From the first day of their careers, they are learning to be systems thinkers rather than specialists and are developing their technical leadership skills. Developing technical *leadership* skills early helps diminish the "halo effect"—when great technical employees get promoted to leadership positions and their great technical performance does not translate to equally great leadership performance. Gaining the ability to see the big picture prevents the "Maslow's hammer" perspective and produces better decision makers and problem solvers.

To reap the benefits of these advantages, program offices must avoid the pitfalls of having junior systems engineers working on their staffs. The career of a junior systems engineer with too much responsibility, too little credibility, too little training, or no mentor can be fraught with peril. Junior systems engineers must be put in a position to succeed. They must be empowered and given responsibility for tasks that are consistent with their capabilities. The organization must have a culture that facilitates mentoring and a pool of senior systems engineers available to provide guidance. Junior systems engineers need to receive domain-specific training to enable them to effectively perform their duties. This training can be accomplished internally or externally. Providing sufficient training, mentoring, and a level or responsibility equal to the junior systems engineers' capabilities will go a long way toward avoiding these pitfalls and developing systems engineers into seasoned, journeyman-level technical leaders in an organization.

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protection and defense of information and IT systems

Information Warfare:
capabilities used to exploit information and IT systems

Networking Technology:
technologies that interconnect groups and/or systems

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Defense AT&L

Writers' Guidelines in Brief

Purpose

Defense AT&L is a bimonthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce.

Submission Procedures

Submit articles by e-mail to datl(at)dau.mil. Submissions must include each author's name, mailing address, office phone number, e-mail address, and brief biographical statement. Each must also be accompanied by a copyright release.

Receipt of your submission will be acknowledged in five working days. You will be notified of our publication decision in 2 to 3 weeks. All decisions are final.

Deadlines

Note: If the magazine fills before the author deadline, submissions are considered for the following issue.

Issue	Author Deadline
January–February	1 October
March–April	1 December
May–June	1 February
July–August	1 April
September–October	1 June
November–December	1 August

Audience

Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style

Defense AT&L prints feature stories focusing on real people and events. The magazine seeks articles that reflect author experiences in and thoughts about acquisition rather than pages of researched information. Articles should discuss the individual's experience with problems and solutions in acquisition, contracting, logistics, or program management, or emerging trends.

The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suited to DAU's journal, *Defense Acquisition Research Journal (ARJ).*

Defense AT&L does not reprint from other publications. Please do not submit manuscripts that have appeared elsewhere. *Defense AT&L* does not publish endorsements of products for sale.

Length

Articles should be 1,500–2,500 words.

Format

Send submissions via e-mail as Microsoft Word attachments.

Graphics

Do not embed photographs or charts in the manuscript. Digital files of photos or graphics should be sent as e-mail attachments. **Each figure or chart must be saved as a separate file in the original software format in which it was created.**

TIF or JPEG files must have a resolution of 300 pixels per inch; enhanced resolutions are not acceptable; images downloaded from the Web are not of adequate quality for reproduction. Detailed tables and charts are not accepted for publication because they will be illegible when reduced to fit at most one-third of a magazine page.

Non-DoD photos and graphics are printed only with written permission from the source. It is the author's responsibility to obtain and submit permission with the article. **Do not include any classified information.**

Author Information

Contact and biographical information will be included with each article selected for publication. Please include the following information with your submission: name, position title, department, institution, address, phone number, and e-mail address. Also, please supply a short biographical statement, not to exceed 25 words. We do not print author bio photographs.

Copyright

All articles require a signed Work of the U.S. Government/Copyright Release form, available at http://www.dau.mil/pubscats/pages/defenseatl.aspx. Fill out, sign, scan, and e-mail it to dat[at]dau[dot]mil or fax it to 703-805-2917, ATTN: Defense AT&L.

Alternatively, you may submit a written release from the major command (normally the public affairs office) indicating the author is releasing the article to *Defense AT&L* for publication without restriction.

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